W O R L D M E T E O R O L O G I C A L O R G A N I Z A T I O N

###### COMMISSION FOR INSTRUMENTS

###### AND METHODS OF OBSERVATION

**CIMO MANAGEMENT GROUP**

**Fourteenth Session**

**Offenbach, Germany**

**5 – 8 April 2016**

**FINAL REPORT**



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**EXECUTIVE SUMMARY**

The Fourteenth session of the CIMO Management Group (CIMO MG-14) was held from 5 to 8 April 2016, in Offenbach, Germany.

The main purpose of the meeting was to develop a strategy for the future of CIMO activities, in the context of WIGOS, and of the possible restructuring of the WMO technical commissions. The meeting also identified strategic activities that would contribute to the vision it developed and assessed whether the current activities were supporting the vision.

The meeting followed-up on relevant decision of the Seventeenth World Meteorological Congress that are relevant to CIMO, as well on issues emerging from the meeting of the President of Technical Commissions and President of Regional Associations (Big data, crowd-sourcing and social media)

The meeting also reviewed the workplans of all CIMO Expert Teams, Task Teams and Theme Leaders to monitor their progress, provide advice, and identify mitigation measures in case of concerns with the ability of certain teams to deliver.

The meeting also addressed a number of topics related to the planning, coordination and management of CIMO activities. These included among others the establishment of an Inter-Programme Expert Team on Operational Weather Radars, the preparation of TECO-2016, plans for future intercomparisons, the review of proposals for new testbeds and lead centres, and the monitoring of the existing ones, collaboration with ISO and HMEI, and matters related to e-learning.

The meeting also agreed on a scheme for awarding certificates to CIMO Experts for significant contributions to CIMO.

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**AGENDA**

1. **ORGANIZATION OF THE SESSION**
   1. Opening of the Session
   2. Adoption of the Agenda
   3. Working Arrangements for the Session
2. **REPORT OF THE PRESIDENT**
3. **CIMO STRATEGIC PLANNING**
4. **CIMO’S CONTRIBUTION TO WMO PRIORITIES AND COLLABORATION WITH OTHER WMO PROGRAMMES, TECHNICAL COMMISSIONS AND REGIONAL ASSOCIATIONS** 
   1. Decisions of WMO Congress relevant to CIMO
   2. Issues emerging from PTC-PRA: Big data, crowd-sourcing and social media
   3. WIGOS and GFCS
   4. Reports of CIMO Focal Points
      * CIMO Focal Point on Climate Observations and Services
      * CIMO Focal Point for the Executive Council Panel of Experts on Polar Observations, Research and Services (EC-PORS)
      * CIMO Focal Point on Disaster Risk Reduction
      * CIMO Focal Point on Gender Issues.
5. **EVALUATION OF THE PROGRESS ACHIEVED IN THE WORK PROGRAMMES, AND PLANS UNTIL CIMO-17 SESSION**
   1. OPAG In-Situ Technologies and Instrument Intercomparisons
   2. OPAG Remote Sensing Technologies
   3. OPAG Capacity Development and Operational Metrology
6. **ISSUES RELATED TO PLANNING, COORDINATION AND MANAGEMENT OF SPECIFIC COMMISSION ACTIVITIES**
   1. Follow-up of Langen Workshop
   2. Inter-commission teams
   3. Arrangements for TECO-2016
   4. Plans for specific workshops (observations at mountain stations, AWS, …testbeds …)
   5. Future Instrument Intercomparisons
   6. CIMO Testbeds and Lead Centres (Nominations and Monitoring)
   7. Collaboration with ISO
   8. Collaboration with HMEI on Tender Specifications
   9. CIMO Awards
   10. E-learning
7. **OTHER BUSINESS**
8. **CLOSURE OF THE SESSION**

# GENERAL SUMMARY

1. **ORGANIZATION OF THE SESSION**
   1. **Opening of the Session**
      1. The fourteenth session of the Commission for Instruments and Methods of Observation (CIMO) Management Group (MG-14) was held at DWD Headquarters in Offenbach, Germany at the kind invitation of the Permanent Representative of Germany with WMO. The session was opened on Tuesday, 5 April 2016 at 9:00, by the president of CIMO, Prof. Bertrand Calpini. He welcomed all the participants to the meeting. The list of participants is given in [Annex I](#Participants).
      2. Dr Paul Becker, Vice-President of DWD welcomed the participants to Offenbach. He stressed that CIMO is a very important WMO technical commission providing invaluable support to the work of other commissions and groups, like the Commission for Climatology, Disaster Risk Reduction (DRR) and the Global Framework for Climate Services (GFCS). He also stressed the importance of comparisons between space-based and surface-based observations to support climate monitoring from space. He reiterated the commitment of Germany to actively support the work of CIMO through provision of experts to its working bodies.
      3. The Director of the WMO Observing and Information Systems Department, Dr Wenjian Zhang, welcomed the participants on behalf of WMO. He informed them of important changes taking place within WMO, like the change in the type of documents that would be submitted to the WMO Executive Council, the expectations from the new WMO Secretary-General and the consideration of a possible restructuring of the technical commissions.
   2. **Adoption of the Agenda** 
      1. The meeting adopted the Agenda as reproduced at the beginning of this report.
   3. **Working Arrangements for the Session** 
      1. The working hours and tentative timetable for the meeting were agreed upon.
2. **REPORT OF THE PRESIDENT**
   1. The president reported on some key aspects relevant to the work of CIMO and to the work of the session. He stressed that the commission has to consider the rapid changes with regard to the requirements of our users, the rapid evolution of technologies and new data sources, as well as the future organization of WMO. He expressed the need to re-think the Roles, Mission and Vision of CIMO in WMO in the near future.
   2. He attended the *Global Climate Observation: the Road to the Future* conference in Amsterdam, March 2016. During this conference, a clear trend towards increased climate observation from space as well as a need for real time climate data delivery was expressed by the climate community. This represents a significant change in comparison to 10 years ago, when the climate community did not want to consider space observations for climate monitoring purposes.
   3. During the last Inter-Commission Group on WIGOS (ICG WIGOS) and the meeting of the Presidents of Technical Commissions (PTC) and Presidents of Regional Associations (PRA) in January 2016, trends in technology and aspects of availability of information were discussed (namely Big Data, Crowdsourcing and Social Media) that will impact WMO and the NMHSs in the near future, and may have significance for CIMO as well. The president expressed the firm view that reference observations will continue to be needed, but that they will be complemented by observations from more diverse sources, including from private sources, or even social media. CIMO will have to determine how it can support Members in adapting to these challenges and how this could be reflected in CIMO’s terms of reference.
   4. CIMO has not only been involved in the definition of best practices for the methods of observation, but has contributed to developing best practices for the documentation of observations. The CIMO representative in the Task Team on WIGOS Metadata, and the MeteoSwiss-WMO project team on OSCAR have made tremendous efforts in defining a comprehensive metadata standard and in building a web-based implementation of it, namely OSCAR/Surface.
   5. The president noted that capacity building and training was at the core of the work of CIMO. He expressed the need for CIMO to increase efforts to initiate e-learning tools and courses where experts can learn best practices associated with methods of observation (such as the CIMO Guide in the form of e-learning courses) that shall complement face-to-face meetings or conferences such as TECO.
   6. The president concluded that in the current context of changes the importance of reference surface- versus space-based observations, the potential of integrating observations from various sources in the spirit of WIGOS, with new trends emerging (external data), and new possibilities for training and capacity building, require a new strategy for CIMO. Strategic Planning is therefore one of the foci of the current CIMO MG meeting. However, he recognized that the core competencies of CIMO experts and the mandate to guide Members with respect to best practices on methods of observation will remain essential.
   7. Finally, he expressed appreciation to all members of the Management Group and to the CIMO Expert Teams (ETs) for the excellent work carried out in the last year.
3. **CIMO STRATEGIC PLANNING**
   1. The meeting participants were informed that the CIMO president and vice-president had spent the day before the meeting in strategic discussion on a required future Vision statement for CIMO, that takes into account the ongoing needs of the WMO community and the changes that are expected to occur over the coming years. The meeting was informed that their initial discussion the previous day had recognized that:

* a significant restructuring of WMO’s technical commissions is expected in the near future (and CIMO may not continue to exist as a stand-alone technical commission for much longer) so the Vision to be developed must be independent of the structure and fit for any structure: what will the WMO community continue to need from a group currently known as CIMO?
* an increasing role will be played by big data in the provision of WMO Member services (e.g. space-based measurements and crowd-sourced data being increasingly used in service areas such as climate monitoring);
* the historical CIMO focus on ensuring that all measurements made by WMO Members meet a minimum (high) standard must shift towards one of ensuring that Members are aware of the quality of the measurements they obtain from different (internal or external) sources, so that they can be sure that they are fit-for-purpose;
* whereas in the past the CIMO focus had been on the introduction of new measurement technologies, in future it may need to shift towards provision of guidance on the optimal integration of data from different technologies;
* the new Vision to be developed will need to be very generic because it cannot be predicted what will need to be measured in a decade’s time or the technologies that might be used to do it;
* whereas, in the past CIMO’s role has been to understand and advise on the capabilities (strengths, weaknesses, data quality, vertical domain of coverage) of our own measurement instruments, in future the focus will need to shift more towards externally-owned instruments and their data;
* the role of space-based measurements of the environment will continue to grow relative to surface-based measurements, so despite the expected primary dependence on surface-based measurements for information in the boundary layer, the focus will need to increase on working proactively with the space community to find improved means of referencing space-based measurements using surface-based measurements;
* irrespective of other considerations, CIMO’s Vision for the future must provide effective support for each of the 12 WMO service applications areas, ensure continuing collaboration with relevant external agencies (BIPM, ISO, etc) and dovetail seamlessly with the EGOS-IP and the WIGOS Vision for 2040, currently under development.
  1. Each of the above considerations had been kept in mind in formulating draft new Vision and Mission Statements for CIMO (see [Annex II](#AnnexII)) and these initial drafts were shared with the session. The participants were then asked to respond to them. The president asked in particular for the session’s views on how the Vision and Mission statements could be strengthened to reflect better the need for CIMO to work more closely with colleagues in hydrology, climate, aeronautical meteorology and the other service delivery progammes, to improve communication with them and increase CIMO’s visibility as the authoritative provider of advice and guidance on measurement techniques and uncertainty, and to increase the users’ understanding of the importance of these to successful service provision.
  2. A key point discussed at some length, that would need to be addressed in refining the new Vision, is a disturbing tendency for crowd-sourced and other cheaply obtained measurements to be viewed by service providers as their new primary source of observational information. These data generally come from external sources, over which we cannot exercise control and of which there is no guarantee of quality or continued supply. These measurements are being increasingly used for numerous purposes, including by the climate community, despite them not necessarily being of a quality fit for these purposes. As a result, NMHSs are becoming increasingly reluctant to expend significant resources purchasing and maintaining their high quality observational networks when these (currently) cheap external data sources are readily available. CIMO’s Vision for the future should address the need to communicate better to the users the importance of fitness for purpose, and to document the quality of these measurements, if downstream services are to remain effective.
  3. It was noted that much of the focus of the draft WIGOS vision for 2040 is on space-based measurements and platforms because these technologies require very long lead times to reach operational state. The vice president suggested that a key role for CIMO in future would be provision of support for the post-launch calibration/referencing/validation of space-based instruments and that these mechanisms need to be known well before launch, so that the design of the satellite instruments can take them into better account. Effective surface-based networks for satellite validation are essential. To achieve this, close collaboration between CIMO and the Space Programme will be critical. There was further discussion of a possible mechanism to initiate this process later in the meeting (see §4.2.5 below).
  4. With respect to DRR, crowd-sourced data will likely become increasingly important in the coming years, so better communication with DRR on the quality of these sources of crowd sourced data will be a key future CIMO activity. But first we will need to learn more about these instruments and document that information better than we have done to date.
  5. With regard to the climate community, we need to help it to better understand the measurement process: we have the tools we need at present, but we are not communicating this well enough. Close collaboration with the climate community on the measurement process and the consequent quality of the data from the various sources will need to be part of our core business in future.
  6. Our current level of collaboration with the atmospheric chemistry community (GAW) is currently good but there is more we can do in regard to ECVs to help them.
  7. With respect to future activities, the meeting recognized the need to work closer to the other communities in reviewing the table on achievable measurement uncertainties available in the Guide to Meteorological Instruments and Methods of Observation (WMO-No. 8, CIMO Guide) and in providing guidance on how to achieve uncertainties suitable to meet the requirements of specific applications listed in the RRR, and ensuring that similar vocabulary is used consistently throughout the related WMO documents.
  8. At the conclusion of its wide-reaching discussion, it was decided to further develop the draft strategy, by adding explanatory text to make it more understandable to all interested parties. This additional text should also depict some of the activities that CIMO plans to organize in the coming years to support it. The vice president agreed to take on this task and to share it with the Management Group once complete. The president requested the vice president to complete the refined version of the CIMO Vision and Mission statement during the following month.

***CIMO’s contribution to the WIGOS Vision 2025/2014***

* 1. Once refined, it was agreed that the new CIMO Vision Statement should be provided as input to future planned WMO meetings addressing the WIGOS Vision 2025/2040 and active participation in those meetings should be sought, to ensure that CIMO contributes directly to the development of the WIGOS Vision 2025 and 2040 for surface-based observing systems via the participation of appropriate CIMO experts. The meeting was reminded that the next meeting of CBS IPET-OSDE, which would begin to address the surface-based component of the WIGOS Vision for 2040, would be held the following week, with CBS ICT-IOS the week after that. At these meetings a plan would be set in place for drafting the surface-based component of the vision in the September-October timeframe, for which a strong CIMO presence will be important. The president requested Messrs van der Meulen and Li, each of whom would be attending the IPET-OSDE meeting, to represent CIMO at it and to provide a brief informal report on it to the Management Group at its conclusion.

1. **CIMO’S CONTRIBUTION TO WMO PRIORITIES AND COLLABORATION WITH OTHER WMO PROGRAMMES, TECHNICAL COMMISSIONS AND REGIONAL ASSOCIATIONS** 
   1. **Decisions of WMO Congress relevant to CIMO**

* + 1. The meeting was informed of the decisions of WMO Congress related to CIMO (See [Annex III](#AnnexIII)).
    2. The meeting assessed whether any changes needed to be made to the CIMO Expert Teams (ETs) and their workplans to adequately follow up on these decisions. The meeting recognized that most actions are already well covered in the ET workplans, but that some may need strengthening.
    3. The meeting acknowledged that current guidance for Members is inadequate on how to avoid blockage of radar wind profiler signals by wind farms. Members need more guidance on how to work with relevant authorities to resolve this problem. It was suggested that documented case studies on the impact of new wind farms on wind profiler performance should be included in the CIMO Guide and would be a valuable aid for NMHSs to use in negotiations with wind farm operators and relevant government agencies early in the wind farm planning stage. The vice-president informed the meeting that Mr Paul Hettrick of the Australian Bureau of Meteorology had been working with experts in KNMI to address windfarm-WPR issues and he would enquire whether the information could be shared with WMO.
    4. It was suggested that a useful first step in assessing the utility of using mobile telecommunication networks to derive rainfall data (Para. 15, [Annex III](#AnnexIII)) would be to acquire signal attenuation data from the operators of such networks, after which an appropriate CIMO expert could be requested to perform a feasibility analysis. It was acknowledged, however, that acquiring the data might prove difficult owing to a lack of willingness on the part of the mobile network operators. Perhaps CBS SG-RFC members could be requested to pursue this issue through ITU.
    5. With regard to communicating to Members the implications of the Minamata Convention on Mercury (para. 15, Annex III), it was suggested that a keynote presentation on the Minamata Convention might be included in the programme of TECO-2016.
  1. **Issues emerging from PTC-PRA: Big data, crowd-sourcing and social media** 
     1. During the 2016 meeting of the Presidents of Technical Commissions (PTC-2016, 19-20 January 2016), the presidents discussed the challenges and risks, opportunities and benefits of big data, crowd sourcing and social media as the basis for production of a guidance document for Members, to be led by CBS (see [Annex IV](#AnnexIV)). The presidents had been invited to prepare a set of essays prior to the meeting, addressing emerging big data issues, crowd sourcing and social media, as discussed in Cg-17. In this context, two essays had been developed by the CIMO president, in collaboration with his colleagues at Meteoswiss, and another had been prepared by the president of CAS.
     2. Reflecting the previous discussion on CIMO strategy, in the light of the discussion on big data and the growing use of space-based data by the climate community, and recognizing the only limited use of surface-based data to validate space-based data, it was suggested that there might be merit in organizing a CIMO workshop to address integration of surface- and space-based measurements. Such a workshop would need to involve experts from CIMO, the space programme, NWP, and climate. The vice-president noted that the Australian Bureau of Meteorology has already framed a strategy on integration of surface- and space-based observations, so he could discuss the matter with Dr Rea and advise the president of the outcomes of that discussion. The WMO secretariat was requested to work with the vice-president and draft a concept paper for a workshop on integration of surface and space-based measurements once Dr Forgan had reported on his discussion with Dr Rea, and circulate it amongst the Management Group.
     3. A question was raised as to the potential for OSCAR to include the new external data sources (such as f. ex. temperature measured by phones) being used by NMHSs. The meeting was advised that OSCAR cannot yet deal with these and that in view of the speed of their evolution, this was not likely to be the case in the future. So it may prove difficult to ascertain and advertise their utility. While inclusion of advice on these data forms might be included in the CIMO Guide or in IOM reports, the meeting concluded that the dynamic nature of these supplementary data sources may require a different mechanism for provision of advice to Members on their characteristics. The challenge to CIMO will be to find a mechanism by which the data can be first characterized, then potential users be informed of their value and limitations.
  2. **WIGOS and GFCS** 
     1. The Meeting was informed of the latest developments of WIGOS and GFCS (see [Annex V](#AnnexV)) and was invited to identify activities that CIMO could undertake to provide support to these WMO priorities.
     2. D/OBS informed that session that the next meeting of the Executive Council would consider how WMO manages the implementation of the GCFS, and that the Observations and Information Department of WMO will have direct responsibility and accountability for the GFCS observations pillar that will provide the backbone for GFCS. While CIMO is application independent and serves all applications, if it does its business well it will contribute significantly to GFCS. Dr Zhang stressed the importance of ensuring that all CIMO activities contribute to the five WIGOS priority areas, to ensure that WIGOS contributes well to the GFCS.

***WIGOS Editoral Board***

* + 1. The meeting was informed that the WIGOS Task Team on Regulatory Material would be discontinued and replaced by a small WIGOS Editorial Board. The meeting agreed that CIMO should be represented in this team by Jitze van der Meulen and requested the Secretariat to seek the approval of the Permanent Representative of Netherlands for his participation in the WIGOS Editorial Board.
  1. **Reports of CIMO Focal Points (FPs)**

***CIMO Focal Point on Climate Observations and Services***

* + 1. The FP on Climate Observations and Services, Dr Bruce Forgan, informed the meeting about concerns expressed by the climate community:
* The potential loss of reference stations due to the development of tiered observing networks.
* The quality of third-party data.
* The difficulty in gathering phenomenon observations (f.ex. thunder, visual observations).
  + 1. The meeting agreed that in view of current changes related to the increased availability of third-party data, of the trend in using radar and satellite data for climate monitoring, CIMO should play a stronger role in developing guidance useful for the climate community and clarifying the expected quality of various measurement types. Such guidance is not only needed for new data types, but also for measurements that the climate community has been using for a long time, and which may not meet its expectations in terms of quality, but could, in some cases, be advantageously replaced by other types of measurements.
    2. The FP on Climate and Observations and Science requested all the CIMO MG members to inform him regularly on climate meetings they are attending and on points that would require attention/action from CIMO.

***CIMO Focal Point for the Executive Council Panel of Experts on Polar and High Mountain Observations, Research and Services (EC-PORS)***

* + 1. The FP for the Executive Council Panel of Experts on Polar and High Mountain Observations (PHORS), Dr Arkady Koldayev, recognized that in spite of a good liaison between the CIMO SPICE project and the Global Cryosphere Watch (GCW), too little collaboration occurred between PHORS and CIMO in the last year. The FP recommended that CIMO takes a pro-active position, proposing areas for collaboration to PHORS.
    2. The Chief of the WMO Observing Systems Division, Etienne Charpentier, informed the meeting that PHORS covers a wide range of activities and that CIMO could best be contributing to the Global Cryosphere Watch (GCW) that is focusing on observations. PHORS established a working group on observations with several sub-groups. Parts of the documentation published by GCW could be published in the CIMO Guide. GCW is starting to build an inventory of best practices and standards related to observations. It will then have to identify those practices that should be promoted and possibly included into the CIMO Guide. GCW would also be highly interested in collaborating with CIMO and RA-VI on the organization of the Workshop on Observations at Mountain Stations. The meeting welcomed the interest of GCW to collaborate on this workshop and recognized it would be a good opportunity to strengthen the collaboration between GCW and CIMO.
    3. The meeting recognized that PHORS is one of the high priorities of WMO and that CIMO needed to strengthen the collaboration with PHORS, and in particular with GCW.
    4. The FP reviewed the first part of the CIMO Guide and identified several areas that needed updating to be relevant for PHORS. Indeed, most of the CIMO guide is focused on moderate climates, but it should be reviewed to cover the whole range of meteorological parameters encountered at Members observing stations. The meeting agreed to invite GCW to contribute to the update of the CIMO Guide to address harsh environments and make it relevant also to GCW. In that context, the meeting stressed that it had been agreed that user requirements were provided in the CIMO Guide Annex 1D Table and that they needed to be removed from relevant chapters where this had not been done yet. The meeting requested the FP to provide the list of issues he had identified for the CIMO Guide to the CIMO Expert Team on Developments in In-Situ Technologies and to the experts that GCW had identified to collaborate with this ET and to request ET-DIST to arrange for the update of the CIMO Guide.
    5. The meeting requested the Secretariat to ensure that the GCW Senior Scientific Officer that will soon be appointed provides support in strengthening the liaison between GCW and CIMO.

***CIMO Focal Point on Disaster Risk Reduction (DRR)***

* + 1. The FP on Disaster Risk Reduction, Dr Jitze van der Meulen, proposed possible contributions from CIMO to support DRR:
* CIMO to develop guidelines and standards to provide stable, reliable instruments and systems, which are designed to withstand the extreme environmental impacts to be expected. An essential constraint is that the observing systems are well maintained, inspected and managed.
* Typical impacts relevant for the technology involved are for instance:
  + high wind impacts: storms, hurricanes, tornados
  + high precipitation impacts: flooding, water resistant
  + lightning impact
  + dust storm impact: build-up of dusk and sand to stop moving parts
  + icing, hail and severe snowfall impact: destruction, blocking moving parts, unreliable measurements
  + manned stations: unavailability of observers and data managers during hazards.
    1. The FP stressed that during extreme weather events, such as hurricane, only very limited information on the meteorological conditions are available because of damage to the infrastructure (not only limited to damage on meteorological instruments and supporting structures, but also due to damage of the telecommunication systems), as well as because potential observers have to retreat to safe areas. It is however critical that access to information is provided during and after hazards to reduce the number of casualties and to support helping teams. The meeting therefore recognized that CIMO should in the future provide added support to DRR for nowcasting and early-response.
    2. The meeting agreed on the need to develop guidance on methods for sustaining observations during severe storms and that satellite communication could be used as an alternate communication means during such events. The meeting therefore agreed to approach Satcom on the possibility to have discussions during TECO-2016 on the need for guidance material on using satellite communications during harsh weather and to postpone decisions related to the possible development of a CIMO Guide chapter on harsh weather to after TECO-2016.

***CIMO Focal Point on Gender Issues.***

* + 1. The Focal Point (FP) on Gender Issues, Dr Volker Kurz, expressed disappointment about the fact that he was never contacted by WMO on gender issues, suggesting the lack of awareness for the existence of this FP position. The FP plans to liaise with contact persons of other commissions to co-ordinate activities.
    2. The meeting recognized the need to be pro-active and to put more emphasis on gender within the commission. The meeting supported the recommendations made by the FP:
* To strongly encourage women to apply for membership in the CIMO Management Group, as well as in all other levels such as membership in and heads of expert teams.
* To lead by example: Women successful within WMO encourage other women to do the same, men successfully promoting and supporting women within their own area of responsibility encourage other men to do the same.
* If possible, international meetings should start after Monday and end before Friday.
* If possible, meetings should not be organized back to back extending over the weekend.
  + 1. The meeting also agreed that skilled women should be approached by members of the CIMO MG and invited to take leading positions within the commission and in the work of the ETs. The meeting requested that when inviting Members to propose experts for the CIMO ETs, the invitation should clearly encourage them to propose women.

1. **EVALUATION OF THE PROGRESS ACHIEVED IN THE WORK PROGRAMMES, AND PLANS UNTIL CIMO-17 SESSION**
   1. **OPAG In-Situ Technologies and Instrument Intercomparisons**

***Expert Team on Operational In-Situ Technologies (ET-OIST)***

* + 1. The meeting welcomed the clear report of the Expert Team on Operational In-Situ Technologies and noted that good progress had been achieved on some tasks while only limited or no progress happened on others. The meeting noted the limited time that the ET-OIST member have to work on the ET-OIST tasks and appreciated that the chairperson had liaised with other interest group related to these tasks. The meeting also noted the request for clarification on some tasks to be able to carry them out appropriately and responded to these below. The meeting recognized that the workplan of ET-OIST constitutes a mix of very different activities. It recommended that the Terms of Reference of ET-OIST and its workplan be carefully reviewed when developing the revised structure of CIMO for the period 2018-2022.
    2. The siting classification and related sustained performance classification are crucial for the implementation of WIGOS, in particular to be able to assess the suitability of specific measurement for different applications. At the time of the development of the siting classification, only limited experience was available on its implementation. ET-OIST is reviewing the experiences made by several countries in implementing it and in assessing the uncertainties linked with the various classes of the classification. The classification will have to be amended to appropriately cover high latitudes and to better quantify the uncertainties associated with each class.
    3. ET-OIST requested guidance related to the development of a standard for the classification of instruments for rainfall intensity measurements. Mr van der Meulen informed the meeting that this standard had also been submitted to ISO TC 113, but that too few ISO members had responded positively to enable the formation of an ISO working group, and that TC 113 is currently seeking the support of ISO TC 146. The meeting recommended to ET-OIST to approach the Technical Commission for Hydrology to assess 1) its interest for this standard, and 2) the appropriateness of the current document before investing more effort in this document. The meeting requested the Secretariat to support ET-OIST in performing this consultation.
    4. As far as the metadata standard is concerned, Mr Ercan Büyükbas informed the meeting that there may be issues with this standard with respect to implementing the siting classification as it apparently includes only one value for a station (instead of one value for each meteorological parameter measured at the station), as well as with some of the terminology used in the siting classification, that may require amendment. As Mr Büyükbas is the CIMO representative in the Task Team on the WIGOS Task Team on Metadata, the meeting requested him to follow-up this issue to ensure that the standard is corrected if needed so that its implementation in OSCAR gives access to the correct classes to Members.
    5. For the task on wind measurement and reporting, the meeting requested Mr van der Meulen to support ET-OIST in corresponding with Hong Kong, toward clarifying the request and assessing and agreeing on whether ET-OIST needs to perform an action, and/or whether other groups should be consulted.

***Expert Team on Developments in In-Situ Technologies (ET-DIST)***

* + 1. The meeting noted that Peter Lejbjuk had resigned from the team and expressed appreciation for the work he performed while on the team. The meeting noted that in the absence of a replacement for Mr Lejbjuk, the team would have difficulties in delivering some of the expected deliverables (Task 3 and 4). The meeting recommended that the Secretariat approaches Environment Canada in order to identify a possible replacement for Mr Lejbjuk.
    2. The meeting expressed some concerns because of the discrepancy between the good progress mentioned in the report and the low percentages in the accomplishment of the tasks in the workplan. The meeting requested the ET Chair to provide a report in June on the deliverables expected to be accomplished by this deadline. This will enable the CIMO MG to assess the need for further prioritizing tasks, and /or identification of alternative approaches, such as tasking an independent expert to develop a report/study on a specific subject.
    3. The meeting recalled the current strong interest of Members for alternative cheaper technologies (such as for example, the use of cheap disdrometers in replacement of rain gauges, optical present weather systems, etc.) and the need to avoid any delay in the delivery of relevant tasks. Mr van der Meulen informed the meeting that KNMI had knowledge on the subject, but expressed concerns in volunteering another KNMI staff to join ET-DIST.

***Expert Team on Instrument Intercomparisons (ET-II)***

* + 1. The meeting welcomed the detailed report of the Expert Team on Instrument Intercomparisons.
    2. The meeting was pleased that the Twelfth International Pyheliometer Intercomparison (IPC-XII) held at the World Radiation Centre (Davos, Switzerland, 2015) had been a success and that the final report was expected to be published shortly.
    3. The meeting also welcomed the progress achieved in the WMO Solid Precipitation Intercomparison (SPICE) and noted that the final report was expected to be available in late 2016. The meeting congratulated the SPICE team for the progress made to date and recommended that an extensive summary of SPICE be published after completion of the experiment to help widely disseminating of the results.
    4. The meeting noted that SPICE had been an extremely challenging intercomparison because of the size (the multi-site approach) and duration of the project.
    5. Upon completion of the SPICE Final Report, the lessons learned from this intercomparison and the challenges experienced should be documented. The meeting recommended that the Secretariat performs an interview of the project leader, Rodica Nitu, and summarizes the lessons learned so that they would be available for the consideration and planning of further intercomparisons.
    6. The meeting was presented with the feasibility study for an intercomparison for upper-air measurements, which provides a feasibility study for *a radiosonde intercomparison* using remote-sensing instrument mainly to support it. Since 2010, not only radiosondes have evolved, but Members are also starting to use remote-sensing instruments for climate investigation. The meeting felt that by concentrating on the radiosonde part of the intercomparison, its potential was greatly diminished in comparison to benefit it could bring in the assessment of integrated observing systems. However, the meeting also recognized that the intercomparison had to remain manageable to be successful. The meeting recognized that it would require additional information prior to being able to make a decision on performing this intercomparison. It also noted that the limit between a feasibility study and a plan for an intercomparison was not clear for the TT and that in view of the nature of the voluntary work of the TT members, and in particular of the need to have a host volunteering to conduct an intercomparison, there was limits to what could be asked from a TT prior to considering one or several hosts for an intercomparison.
    7. The meeting requested the TT to include more details on the remote-sensing aspects of the intercomparison to assess the comparability of land-based and space-based observing systems, and possibly other in-situ systems (AMDAR,..) with the radiosondes, and to clarify what was meant at the end of the conclusion *“While the inclusion of remote sensing is sensible and feasible, logistical and political aspects require careful planning”* by providing anoutline for a plan for an intercomparison including the proposed instruments.
    8. The meeting was pleased with the progress made towards producing a feasibility study for an Intercomparison for volcanic ash/aerosol detection. It noted that it was premature for the MG to make a decision on the conduction of such an intercomparison. The meeting also noted that the current documentation suggested several sites and that it would have to take into account the lessons learned with SPICE for the approval/planning of a mutli-site intercomparison.
    9. With respect to the tasks related to liaising with other communities and priorities for future intercomparisons, the meeting recommended that the chairperson leads them and decided to rename task 4 to “Potential future intercomparisons” that would lead to an updated list of potential intercomparisons.

***Expert Team on Aircraft-based Observations (ET-AO)***

* + 1. The meeting welcomed the report of the Expert Team on Aircraft-based Observations and the progress of its work. The meeting appreciated the progress made towards characterizing the quality of the water vapor sensors.
    2. The meeting recognized that aircraft-based observations are currently described in an individual chapter of the CIMO Guide, with little link to other upper-air observation technologies. It would be useful for Members if future updates of the CIMO Guide would provide a more integrated presentation of these technologies.

***Expert Team on Radiation Reference (ET-RadRef)***

* + 1. The meeting was informed of the increasing concern within the infrared community, particularly in the Baseline Surface Radiation Network (BSRN), on the confidence in the future use of the World Infrared Standard Group (WISG), given the offset to the results from comparisons with the Infrared Integrating Sphere (IRIS) radiometers and the Active Cavity Pyrheliometer (ACP), and most importantly the inability to duplicate the initial calibration of the WISG through its primary reference, the Absolute Spectral Radiometer (ASR) developed by Physikalisch Meteorologisches Observatorium Davos/World radiation Centre (PMOD/WRC). So far there has been no restoration of the ASR to operation. Recent reaction to published papers on the WISG-IRIS difference has further heightened concern. If the ASR can be restored to functioning and participate in future intercomparisons there would then be at least three radiometers that could function similar to the World Radiometric Reference (WRR) suite, and reduce the reliance on the relative instruments that make up the WISG. An intercomparison of pyrgeometers is being planned for 2016/2017 by the BSRN community and it would be useful if a functioning ASR could participate.
    2. The meeting endorsed the efforts of the BSRN community to assist in examination of the traceability of the WISG. The meeting requested the president and vice-president of CIMO to encourage PMOD/WRC to restore the basis of the WISG, the ASR, to an operational state and encouraged its participation in the infrared comparison being planned by the BSRN community for 2017.
    3. The meeting was informed that the preliminary results of the Twelfth International Pyrheliometer Comparison (IPC-XII) suggest that the difference between the World Radiometric Reference (WRR) and the International System of Units (SI) is not as clear as it was believed to be, and that further work/investigations will be needed before a clear recommendation to change the WRR could be done. The meeting was also informed that discussion and presentations at the IPC highlighted the frustration of the solar resource community on the difference between the WRR and SI, and the impact it was having on the renewable energy industry economic activities. There was considerable disappointment on the slowness of the process finalising a relationship with known uncertainty between the SI and WRR for total solar irradiance, and the likelihood that no changes (if any) would be endorsed and propagated by WMO before 2019 or later.
    4. The use of limited solar bandwidth instruments at the Twelfth International Pyrheliometer Intercomparison (IPC-XII) to generate broadband solar irradiance data that can be compared to traditional pyrheliometer data, could impact on the future of solar measurement networks. While a complex method to generate a measurement with potentially significant uncertainty, the IPC-XII results showed that there is significant potential in the method. If this method is taken up by solar resource and monitoring networks then CIMO must be confident that it can incorporate such developments into the CIMO Guide in due time.
    5. The meeting was presented with a video presenting IPC-XII and the value it has for its participants. The meeting congratulated Meteoswiss for the development of this film which will help Members to explain and justify the importance of their attendance at IPCs.
  1. **OPAG Remote Sensing Technologies**

***Expert Team on Operational Remote-Sensing Technologies (ET-ORST)***

* + 1. In view of the request by Cg-17 for CIMO to establish a CIMO/CBS-led international coordination initiative for standardization of practices and procedures for weather radar systems (see par. 12 of [Annex III](#AnnexIII)), the meeting recognized the need to review whether all the weather-radar related tasks of the ET-ORST workplan needed to be continued (and if so, transferred to the radar coordination group), or whether some should be terminated. The meeting noted that the OPAG Chair, in his report to the CIMO-MG, proposed several new topics that could possibly be included in the workplan of new coordination group. The meeting agreed that all the weather-radar related tasks of ET-ORST would originally be transferred to the new group and that it would be up to the CIMO MG, in consultation with the CBS-MG to agree on the workplan of that group and possible changes to these tasks.
    2. The meeting welcomed the information from the OPAG Chair, Li Bai, that China had established an integrated testbed for lightning detection that could provide suitable conditions for validation and comparison of lightning detection by ways of artificial lightning and lightning strikes. The meeting encouraged China to propose this testbed as a CIMO testbed through the agreed testbed nomination process and to share with CIMO results obtained at this testbed.

***Expert Team on New Remote-Sensing Technologies (ET-NRST)***

* + 1. The OPAG Co-chair informed the meeting of the communication challenges faced by ET-NRST, which has never met, that includes several members who have only recently joined CIMO and who are located over a wide range of time-zones. The OPAG Co-Chair recommended that a meeting of this team be organized as a priority, to enable significant progress in several tasks and offered to host this meeting in Turkey.
    2. The meeting recognized that the vice-chair, being located in Europe, is in a time-zone that enables easy communication with other parts of the world. The meeting requested that Mr Apituley takes a stronger coordination role within ET-NRST to support the chair, coordinating at least the contributions from Europe, including those from testbeds and lead centres. The meeting requested Mr van der Meulen to approach Mr Apituley and to advise him on this matter.

***Theme Leader on Radio-Frequency Protection (TL-RFP)***

* + 1. The meeting was informed that Oguzhan Sireci, one of the theme leaders on radio-frequency protection (TL-RFP), had resigned from his position. No progress report, nor response was received from the other TL-RFP by the OPAG-Co-chair. The meeting requested that the OPAG Co-chair continues to try and liaise with the TL-RFP and that the Secretariat takes the opportunity of the next visit of the TL-RFP in Geneva to urge him to communicate more effectively with CIMO MG, and CIMO ETs.
    2. The meeting appreciated the offer of Rabia Merrouchi to act as additional focal point on radio-frequency protection in case of need and noted that experts representing CIMO in RFP activities be also part of their national delegation at ITU meetings.
  1. **OPAG Capacity Development and Operational Metrology**

***Expert Team on Operational Metrology (ET-OpMet)***

* + 1. The meeting expressed appreciation for the work carried out by ET-OpMet. The meeting agreed with all the recommendations from ET-OpMet. Details are given below.
    2. The meeting approved the calibration strategy developed by ET-OpMet and the plan of ET-OpMet to include it into the CIMO Guide and to develop relevant guidance material. The meeting requested ET-OpMet to proceed in that direction and to review the diagrams with particular care to ensure they convey the appropriate messages.
    3. The meeting agreed with ET-OpMet on the need to fully revise Chapter 2 to 4 of the CIMO Guide Part I, in collaboration with ET-OIST. The meeting requested ET-OpMet and ET-OIST to work collaboratively on the update of these chapters.
    4. The meeting agreed that developing guidance on how to adapt to the Minamata Convention on Mercury and developing guidance on how to select instruments for replacing outdated instruments and how to maintain and calibrate these new instruments should be addressed as a matter of urgency by ET-OpMet.
    5. On the task addressing the traceability of ceilometers, the president invited ET-OpMet to liaise with Mr Alexandre Haefele who is actively involved in relevant activities carried out within EUMETNET. Mr van der Meulen informed the meeting that one of his colleagues is preparing an IOM report on the traceability of transmissiometer and that he would coordinate the provision of this material to CIMO when it would be ready.
    6. The meeting recognized the need to review the guidance related to station inspection (such as frequency of the inspection) that is provided in the Manual on the Global Observing System (GOS) and Guide to the GOS to ensure they are compatible with current understanding of measurement uncertainties and that the recommended practices mentioned in these documents are in line with Members’ expressed requirements.

***CIMO Editorial Board (EdBd)***

* + 1. The meeting noted the report of the Chair of the CIMO Guide Editorial Board. The meeting was concerned by the fact that 2014 Edition of the CIMO Guide had not yet been published and was strongly disappointed by the slowness of the process for finalizing the publication. It expressed bewilderment because the practices described in the Guide are at the foundation of WMO’s work (even if not having a regulatory aspect), but seem not to be given appropriate consideration in the WMO publication process.
    2. The meeting recognized that the delay in the publication had several negative consequences for WMO as a whole: lack of consistency between publications (the WIGOS regulatory material making reference to the 2014 Edition of the CIMO Guide, lack of availability of material for Members, difficulties in coordinating the updates of the CIMO Guide and the WIGOS regulatory material documents, such as the Manual on WIGOS, which include practices elevated from the CIMO Guide, lack of respect for the work of the experts who contributed to the update, and difficulties in launching the next update cycle within CIMO.
    3. Several members informed the meeting that they are receiving regular queries from users on the status of the update, and expressing frustration about the unavailability of the 2014 Edition to support their work.
    4. The meeting requested the president to discuss this matter with the WMO Secretariat higher management for clarification on the process and to find a viable solution for the future.
    5. The meeting noted that several members of the CIMO EdBd may not be available after next CIMO session and requested all MG members to identify potential suitable replacements (with very good English knowledge) in view of training them to take over these responsibilities and to inform the Secretariat on such possible candidates by mid-May 2016.
    6. The meeting requested the CIMO EdBd to work collaboratively to avoid duplications and contradictions in the procedures used and documents treated by both boards.

***Theme Leader on Radiosonde Performance Monitoring (TL-RPM)***

* + 1. The meeting welcomed the report of the Theme Leader on Radiosonde Performance Monitoring (TL-RPM) and noted the importance of his work to ensure radiosonde measurements quality.
    2. The meeting requested the TL-RPM to review the content of the CIMO Guide and of relevant WMO Manuals (e.g., Manual on Codes) related to definition of surface pressure and geopotential height for radiosounding to ensure they are in agreement and not subject to ambiguous interpretation, and to develop relevant updates for these documents, if needed. The meeting welcomed the offer of Jitze van der Meulen to give advice to the TL-RPM and invited Dr van der Meulen to contact the TL-RPM.
    3. Members have expressed difficulties in accessing the ECMWF list of suspect stations, which used to be published in the WWW Operational Newsletter that is not distributed anymore. The meeting therefore requested the Secretariat to include a link to the ECMWF list of suspect stations on the relevant WMO radiosonde monitoring webpage to ensure that Members have easy access to this list.
    4. It appears that several Members are not reporting the full high resolution upper-air measurements in the BUFR reports, which has negative impacts on the ability of forecasting centres, which are relying on those data. The meeting noted that most systems enable the acquisition of these high resolution measurements and requested the TL-RPM and the Secretariat to invite CBS to sensitize Members to the importance of providing full high-resolution upper-air measurements.
    5. The TL-RPM, through his activity of identifying problems, informing stations and helping them in solving the problems is effectively providing a data quality monitoring process. The meeting stressed the importance to ensure that an appropriate contact and feedback mechanism will be implemented in the WIGOS data quality monitoring linked to OSCAR and noted that WIGOS is in the process of establishing a Task Team on the WIGOS Data Quality Monitoring System (TT-WDQMS). It recommended that TT-WDQMS ensures that relevant and manageable feedback mechanisms will be implemented within OSCAR and possibly in collaboration with regional centres to communicate with individual Members on quality issues, such as those communicated by the TL-RPM.
    6. The meeting requested the CIMO president and vice-president to liaise with the WIGOS Project Office and TT-WDQMS Chair to identify which type of expertise from CIMO is required for TT-WDQMS to ensure that CIMO could then identify and contribute needed expertise to this team.

***Task Team on the International Cloud Atlas (TT-ICA)***

* + 1. The meeting appreciated the extensive work carried out by TT-ICA to finalize the revision of the text of the International Cloud Atlas and to collect images.
    2. The meeting noted that the timeline for completing the project by the end of the year, so that the ICA website will be fully functional, tested and available by the time of the 2017 World Meteorological Day (Theme: “Understanding Clouds”) is very tight. The meeting requested the TT-ICA and the Secretariat to make all efforts needed to ensure timely completion of the project. The meeting committed to speedily carry out the external review of the ICA website design as soon as it would be available.
    3. The meeting approved the revised text of the ICA and requested CIMO MG members to provide final comments, if any, by 15 April at the latest. As parts of the text have the status of Annexes to the WMO Technical Regulations, the meeting requested the Secretariat to distribute the text to all WMO Members for their review and to submit a document to EC-68 seeking the support of the Council for the President of WMO to approve the draft text of the revised ICA by correspondence on behalf of the Council, subject to no significant concerns with the draft text being expressed by Members by the time of expiry of the review period.

***Task Team on Competencies (TT-Comp)***

* + 1. The meeting was pleased by the progress made by TT-Comp. It recalled that TT-Comp had submitted a complete set of competencies for review by CIMO MG members and by members of the Education and Training community at the end of 2015. General agreement and appreciation were expressed by these groups of reviewers, and some suggestions for improvements were made.
    2. While developing the competencies linked with the procurement of equipment and other functions, the Task Team recognized that some of these tasks were very closely linked to observing network and observing programme management. This led to the development of the fourth set of competencies: the "Competency framework for Observing Programme and Network Planning" (provided in INF. 10) that actually goes beyond CIMO responsibilities into CBS responsibilities. Therefore, this fourth set of competencies was provided to CBS Management Group for review and advice on the way forward for their finalization. Mr Dibbern, Chair of the CBS OPAG-IOS, informed the meeting that CBS ICT-IOS will review this document and provide feedback to CIMO so that TT-Comp can also finalize this 4th set of competencies.
    3. The meeting noted that TT-Comp would likely complete the tasks assigned to it before the next session of CIMO. The meeting expressed great appreciation for TT-Comp’s contribution and recommended not to disband the team on completion of the tasks, but to invite its members to join and contribute to other CIMO activities.

1. **ISSUES RELATED TO PLANNING, COORDINATION AND MANAGEMENT OF SPECIFIC COMMISSION ACTIVITIES**
   1. **Follow-up of Langen Workshop**
      1. The CIMO/WIGOS Exploratory Workshop: Improving Surface-based Data Quality through Improved Standardization of Procedures (Langen, Germany, 3 to 5 December 2014) provided 11 Recommendations to the CIMO MG related to standardization which were considered to be important for facilitating improved surface-based data quality. CIMO MG considered and responded to each of the recommendations. Subsequently, considerable progress has been achieved in actioning many of the recommendations, with Recommendations 5, 6, and 11 now completed..
      2. **Recommendation 1:** RAs ensure that the RIC activities defined in each Regional WIGOS Implementation Plan are implemented with priority. **Partly completed**. A special task team for the activities of RICs (TT-RIC) was established by RA-VI. The TORs include activities for improving the efficiency of RICs, efficient cooperation among RICs, and increasing beneficial use of the RICs by Members. These activities have also been defined in R-WIP-VI which will be carried out by TT-WIGOS in collaboration with TT-RIC. In addition, a survey of the needs of Members and their laboratory capacities has been conducted.
      3. **Recommendation 2:** Other NMHS calibration laboratories should become accredited under ISO 17025 to achieve WIGOS traceability and quality improvement goals. Those NMHS which have achieved accreditation and have the capability and the commitment, will be encouraged and assisted to apply for RIC accreditation. **Underway.** NMHS with sufficient capability are being encouraged to nominate to be a RIC. The survey noted in 6.1.2 above also addresses this recommendation. An Interlaboratory Comparison (ILC) in RA-VI has been planned and an intercomparison of temperature, humidity and pressure calibration procedures will be held before the end of 2016.
      4. **Recommendation 3:** Regional Instrument Centres should establish traceability of and calibration services for precipitation, wind and solar radiation measurements. **Underway.** RICs without these capabilities are being encouraged and supported to establish required infrastructure for these features and activities such as workshops and seminars within/between RAs will be proposed.
      5. **Recommendation 4:** Regional Instrument Centres should provide support to the surface-based remote sensing community in its efforts to develop traceability of measurements made by existing and emerging remote sensing technologies. **Not yet addressed.** This matter is not straightforward and requires further discussion by the CIMO MG before moving forward.
      6. **Recommendation 5:** CIMO and CBS Management Groups seek the support of the Inter Commission Coordination Group on WIGOS to establish a CIMO/CBS-led international coordination mechanism for weather radar systems and their data and products, which involves the participation of nations operating large weather radar networks, capitalizes on the positive experience achieved within regional cooperation mechanisms, such as OPERA and BALTRAD in Europe, and includes a strong focus on capacity development. **Completed.** Cg-17 has requested CIMO to go ahead with establishment of the proposed CIMO/CBS IPET and the team is expected to meet for the first time late in 2016.
      7. **Recommendation 6:** The CIMO Management Group review the work plan of the relevant Expert Teams to ensure that high priority is assigned to tasks examining the traceability and quality improvement of the more mature remote sensing products, for example, vertical wind profiles (from radar wind profilers and weather radars), and develop guidance material for inclusion in the CIMO Guide and other relevant material. **Completed.** The Work Plan of each ET has been reviewed and revised where required to ensure high priority is assigned to these tasks.
      8. **Recommendation 7:** The CIMO Management Group review the work plan of the relevant Expert Teams to ensure that high priority is assigned to tasks proposing a quantitative definition for cloud base to assist subsequent establishment of traceability for ceilometer measurements. **Partly completed.** Work Plans have been reviewed but the topic is not currently included in any of them. Further action awaits discussion by CIMO MG.
      9. **Recommendation 8:** CIMO Management Group should encourage Members to nominate Testbeds and/or Lead Centres for those technologies currently under-represented by existing Testbeds and Lead Centres. **Underway.** Circular letter sent by SG to all PRs in February 2016 renewing the call for new Test Bed / Lead Centre nominations. CIMO MG members to continue to urge experts in their respective RA to submit proposals.
      10. **Recommendation 9:** The CIMO Management Group should review the relevant Expert Team workplans to include tasks aimed at developing a roadmap for Regional Instrument Centres, Testbeds and Lead Centres for progressively improving performance against their Terms of Reference. **Underway.** Work Plans reviewed but not yet modified to include this. May require further consideration by CIMO MG.
      11. **Recommendation 10:** That CIMO Management Group review relevant workplans to include investigations, guidance and the use of Observations Systems Capability Analysis and Review (OSCAR) Tool to increase the utility of, and benefits from, observational products derived from the integration or compositing of measurements from multiple technologies. **Underway.** Work Plans reviewed and items added on development of guidance on the use of integrated observations (e.g. rainfall). Use of OSCAR awaits its operational implementation.
      12. **Recommendation 11:** That WMO consider allocating additional resources to the Instruments and Methods of Observation budget to enable priority attention to be given to these matters. **Completed.** D/OBS included consideration of this matter in his budget proposal to Cg-17 for the 2016-19 financial period.
      13. At the conclusion of his report, Mr Buyukbas informed the session that Turkey would like to apply for RIC status for its well-equipped and accredited calibration laboratory, which has organized regular training courses in recent years. The interest in Turkey establishing a RIC was welcomed by the session and Mr Buyukbas was encouraged to complete and submit the requisite documentation to RA VI for its consideration.
   2. **Inter-commission teams**
      1. The meeting welcomed the presence of Mr Jochen Dibbern, the co-chair of the Commission for Basic Systems (CBS) Open Area Group (OPAG) on the Integrated Observing Systems (IOS), at the meeting to address the establishment of an inter-commission coordination group on weather radars. Mr Dibbern made a presentation on the collaboration between CIMO and CBS. He welcomed the increasing collaboration that has been taking place between the two commissions.
      2. Mr Dibbern addressed the WMO governance restructuring which envisages a reduction of the number of WMO TCs and adjustment of the TCs to the WMO scientific and technical programmes. He expressed the need to ensure that WMO Members know what to measure and how to measure it, which is actually the basis for WMO’s work. In this context, he expressed the opinion that it would not be appropriate for WMO to create a commission that would be even bigger than the current CBS, but would favor to cut the current CBS between the infrastructure and service parts, so that the basic services needed for Members are delivered to them, and considering which other parts of CBS could potentially be transferred to other commissions.
      3. Mr Dibbern noted the limitations that WMO Technical Commissions are faced with, which include among others the reduction of the number of available experts, and the fact that the process for nominating experts in WMO TC expert teams does not always guarantee that appropriate experts are constituting the teams. Mr Dibbern stressed that in the case of the establishment of the radar group, it would be critical to ensure that appropriate experts are part of the team. He recommended to invite the nominated chairperson to propose the persons he/she would like to be included in the group.
      4. The meeting recalled that the Seventeenth Session of the World Meteorological Congress (Cg 17) agreed to the need for a single international coordination mechanism for weather radar systems and their data and products, that utilizes existing bodies as far as possible, to achieve global weather radar data consistency. Congress requested CIMO to establish a CIMO/CBS-led international coordination initiative for standardization of practices and procedures for weather radar systems, reinforcing the Langen workshop recommendation by reiterating that the group should include all Members, partners and entities operating weather radar networks, capitalize on the positive experience achieved within regional cooperation mechanisms, such as OPERA and BALTRAD in Europe, and include a strong focus on capacity development to ensure coordinated weather radar data quality across regions.
      5. The meeting considered possible ways to establish this collaboration mechanism and noted the deliberation of the CBS Management Group related to this matter. The meeting recognized the urgency to establish the group, and that it would be crucial to establish a clear leadership for it and to clarify responsibilities in terms of deciding on its activities, carrying them out and reporting on them. The meeting noted the concern of CIMO MG members that having a co-chairmanship for the group may weaken its leadership and that it would be better to have a unique chairperson that is accountable to both CIMO and CBS on the delivery of its activities. The meeting agreed that the best solution would be to establish an Inter-Programme Expert Team on Operational Weather Radars under CIMO, which would submit relevant outcomes to either CIMO and/or CBS for approval depending on the topics concerned. The IPET Chairperson could also be invited to attend CBS Implementation/Coordination Team on Integrated Observing Systems (ICT-IOS) meetings, as needed. The meeting further recognized the need to minimize the work required for coordination of the IPET, while ensuring it is addressing the requirements of the various WMO Programmes. Therefore, the terms of reference of the IPET should clearly stipulate that CIMO has to consult CBS on the establishment of the team, its membership and its workplan. The meeting agreed on the Draft Terms of Reference for IPET-OWR, as provided in [Annex VI](#AnnexVI) and noted that they would have to be submitted to the WMO Executive Council for approval.
      6. The CIMO MG and Mr Dibbern unanimously recommended to invite Mr Daniel Michelson to be the chair for the IPET, as he is well recognized and valued by both communities and able to lead such a team.
      7. The meeting further recognized that Mr Michelson should be invited to nominate a vice-chair, whose leadership role is mainly to step in for the chair when he is not available, and to coordinate activities on request of the chair.
      8. The meeting was pleased with these plans for an effective collaboration between CIMO and CBS in the area of weather radars, that will strongly contribute to the success of WIGOS, by addressing standardization and quality control of weather radar data and their exchange between WMO Members.
   3. **Arrangements for TECO-2016**
      1. The meeting was informed about the plans for the organization of TECO-2016 that will be held from 27 to 30 September 2016 at the Feria de Madrid, Madrid, Spain and will be organized in collaboration with UKIP Media and Events that will be hosting in parallel the Meteorological Technology World Expo 2016 (27 to 29 September 2016). A series of other events will take place in conjunction with these events. These are SatCom 2016, the 2016 meeting of the International Forum of Users of Satellite Data Telecommunication Systems, which will take place from 27 to 29 September 2016 in another auditorium at Feria de Madrid, the Second Metrology for Meteorology and Climate Conference, MMC 2016, and meetings of the ISO Technical Committee 146 Sub Committee 5, working groups on Weather Radar and Wind Lidar standards, respectively.
      2. The meeting was impressed by the number of events planned in conjunction with TECO-2016 and urged the Secretariat to ensure that sufficient secretariat and logistical support would be available to ensure the smooth conduct of all events.
      3. The meeting discussed possible topics for discussion sessions during TECO-2016, that would be relevant to current and potential future focus areas of CIMO. The meeting identified three topics (1. Big data, crowd-sourcing and third party data, 2. Impact of Automation and 3. Instruments and Methods of Observation aspects of the WIGOS Vision 2025/40) and recommended that they be considered as themes for discussion sessions at TECO-2016. The meeting requested the president, vice-president and Secretariat to refine and finalize those themes as needed in the context of the evolving CIMO and WMO priorities.
      4. The meeting requested all the members of the CIMO MG to send suggestions for keynote speakers to the conference director, Bruce Forgan, by 30 April 2016.
      5. The meeting recommended that a second announcement be circulated throughout WMO Members to invite for submissions of abstracts and early registration.
   4. **Plans for specific workshops**

***RA-VI/CIMO Workshop on Observations at Mountain Stations***

* + 1. The meeting was informed on the progress of the planning of the CIMO-RA-VI Workshop on Observations at Mountain Stations (see concept note provided in [Annex VII](#AnnexVII)).
    2. As the topic of this workshop is closely related to the interests of EC-PHORS and the Global Cryosphere (GCW) Watch, the meeting agreed with the proposal to invite GCW to contribute to its organization to ensure the workshop outcomes are relevant to a variety of WIGOS stakeholders and to foster collaboration with GCW.
    3. The meeting agreed with the draft concept note and recognized that in view of the approaching completion of the WMO Solid Precipitation Intercomparison Experiment (SPICE), it would be timely to organize this workshop in 2017 to be able to capitalize on the experience gained during SPICE and which are of relevance to the subject. The meeting recommended to involve relevant experts from SPICE to contribute to the organization of the workshop as well as from ET-DIST, which has a task related to development of guidance in cold/mountain regions.
    4. It is expected that the workshop would accommodate up to 70 participants and that that the workshop would develop recommendations for Members and actions by relevant groups. The meeting requested the president and Secretariat to liaise towards establishing the International Programme Committee for the workshop.

***Automatic Weather Station Conference***

* + 1. Mr van der Meulen presented a plan to revive a series of Conferences on Automatic Weather Stations (AWSs). In spite of the wealth of information published on AWSs, requests for support and training remain, partly because of the performance issues that Members face following the introduction of AWS networks. Reasons for these problems are believed to have a very diverse nature (technical, management, policy). Effective training (capacity development), focussing on the specific issues related to AWS, may have a positive impact, but the lack of experience with automation and remote control in general seems to be the principle reason, and exchange of experiences (on all types of relevant topics) is expected to be an effective approach to improve the situation. The range of topics to be addressed at such conferences is very large and justify organizing it as a conference rather than as a workshop.
    2. CIMO-16 and ICG-WIGOS-4 had welcomed the proposal to stimulate Members in organizing ICEAWS, but no Member volunteered to organize such a Conference in the last years. Mr van der Meulen proposed that CIMO takes the lead in organizing a first conference. Follow-up (biennial) conference could be organized in different regions and CIMO could provide support to the scientific organization of these conferences. The scope of the follow-up conference could be more focused to the specific problems encountered in the Region organizing it.
    3. The meeting strongly supported that CIMO organizes the first conference on AWS, which could be titled *“Automated stations for environmental intelligence - the AWS in the 21st century”* and agreed that it would do it in the collaborative WIGOS spirit as the topics to be discussed in the conference are partly beyond the responsibility of CIMO and also relevant to other technical commissions, and to many application areas.
    4. The meeting recognized that specific topics requiring follow-up might emerge from the conference and that subsequent workshops may be needed to address them. The meeting recommended that the first conference be organized in a manner similar to a CIMO TECO, with lots of presentations selected from an open call for contributions and also including some discussion sessions out of which general recommendations for Members could be compiled and possible actions for technical commissions identified.
  1. **Future Instrument Intercomparisons**
     1. The meeting recalled that two intercomparison feasibility studies are currently under way and that it had requested that the feasibility study on upper-air measurements be refined to clarify the plans for the use of remote-sensing measurements (see paras. 5.1.14-15). The meeting therefore decided to defer the endorsement of specific intercomparisons to the time it would receive a completed feasibility study. The meeting agreed to organize teleconferences to review the outcomes of feasibility studies and make relevant decisions on the possible endorsement and start of an intercomparison in the near future, if appropriate/required.
  2. **CIMO Testbed and Lead Centre (TB/LC) Nominations and Monitoring**
     1. Mr Hartley advised that two applications had been received for the establishment of new Testbeds/Lead Centres. One received from Kazakhstan lacked details and appeared generally incompatible with the terms of reference for a CIMO Lead Centre but might be more suited as a RIC, should the application have provided much more details. The other application, from KNMI, proposed the designation of Cabauw as a CIMO Testbed, was a strong application but required updated versions of the accompanying documents with working links. The meeting recommended to the president of CIMO to designate Cabauw as a CIMO Testbed. The president of CIMO agreed with this proposal and requested the Secretariat to inform Netherlands and Kazakhstan about those decisions.
     2. Mr Hartley reported on the status of the existing Testbeds and Lead Centres (see [Annex VIII](#AnnexVIII)). He noted that it was good to see that all TB/LC had provided detailed progress reports. A marked improvement in communication had occurred since the advent of the TB/LC webpages, which have enabled the TB/LC to readily communicate their recent achievements, and with the addition of a representative from each TB/LC to the appropriate ET’s membership.
     3. Mr Hartley expressed some concern with the Korean TB and LC, the activities of which appear to be particularly focused on Korea, and noted that there has been only limited collaboration of these centres in CIMO activities since their inception, apart from their participation in CIMO TECO and SPICE. Mr Hartley suggested the secretariat to send a letter to Boseong and to Chupungnyeong urging them to strengthen their TB/LC activities for the benefit of all WMO Members.
     4. According to their Terms of Reference, CIMO Testbeds and Lead Centre must provide at least one report every two years to the CIMO-MG. The next biennial reports will be requested for 31 March 2018. This date may be modified, depending on the timing of the 2018 CIMO MG meeting to ensure the reports will be available for consideration prior to that meeting.
  3. **Collaboration with ISO**
     1. The meeting was informed about the status of collaboration with ISO towards developing common ISO-WMO standards.
     2. Mr van der Meulen informed the meeting on the progress of the standard for classification of instruments for rainfall intensity measurements that had been proposed to CIMO, as well as to ISO TC 113. It appears that too little experts were nominated to form a working group under ISO TC 113. The standard development was therefore put on hold and TC113 is now considering to approach ISO TC 146 for support. The meeting requested CIMO ET-OIST to approach the hydrological community to assess its interest in having such a standard. The meeting requested the Secretariat to support this process.
     3. The meeting expressed its thanks to all experts that are actively representing CIMO, and more generally WMO, in the ISO standard development process.
  4. **Collaboration with HMEI on Tender Specifications**
     1. The meeting was informed about the progress of the HMEI Tender Specifications project. In 2014 HMEI developed a very detailed draft project plan. WMO feedback to HMEI led to improvements to the draft though WMO concerns regarding the ambitious nature of the project remained. Whereas it had originally been envisaged that the project involve the development of a single generic template for tender specification, the project plan described the development of numerous templates, one for each type of equipment. Little further progress happened until recently, when HMEI approached WMO, seeking its support for a new approach to the project, involving World Bank participation and envisaging hiring a consultant to carry out the major part of the work. A draft project proposal and terms of reference for a project officer who would lead a HMEI/WMO team to develop a tender specification for ’synoptic weather station observing equipment’ was provided to WMO. The team was to include two experts from the CIMO community and two representatives of HMEI.
     2. The meeting welcomed the efforts of HMEI to lead this development towards providing a tool that would benefit and support WMO Members for the procurement of meteorological instrumentation/systems and committed to review its outcome towards its possible adoption by CIMO and its possible inclusion in the CIMO Guide, if appropriate. The meeting recognized that the project must not be limited to instrumentation, but that it would require including aspects such as data transmission and databases which are beyond the responsibilities of CIMO.
     3. CIMO MG members expressed several concerns with regard to the feasibility and suitability of this project: AWSs may not be the appropriate solution to meet Members requirements for measurements; amount of resources required by the project appears to be large; there may be difficulties to ensure compatibility with the national laws that need to be followed in each country, etc…
     4. The meeting also recalled that WMO had nominated a focal point for the project and that CIMO had nominated a representative for the project advisory board, but that limited interaction had taken place between HMEI and these representatives. It also noted the limited effect that the comments provided by WMO had on the proposed project.
     5. The meeting therefore agreed that the point of contact for correspondence with HMEI on the HMEI Tender Specification project must be the WMO Secretariat. The meeting also recommended that CIMO rather focuses its effort on developing a short document helping Members understanding the procurement process and what they need to do to ensure that the systems they purchase will achieve the sustainable measurements needs they have for their applications.
     6. The meeting requested Bruce Forgan and Bruce Hartley to develop a concept on what should be developed by CIMO for guiding WMO Members on their procurement activities towards sustaining measurements, including possibly the development of e-learning material.
  5. **CIMO Awards**
     1. At its last session, the CIMO MG agreed on a scheme for granting CIMO certificates to experts who contributed significantly to the work of CIMO. The scheme has 3 different levels of certificates and the process for awarding the certificates should be administratively light. The meeting reviewed proposed forms for the nominations for the two higher-level certificate types and tested the form for submission of outstanding contributions on a potential candidate. The meeting approved the forms as provided in [Annex IX](#AnnexIX) and requested the Secretariat to arrange for posting the procedure and the forms on the website, together with a list of experts having received the outstanding awards, in a way similar to that used for the Vaisala Awards.
     2. The meeting recognized that Mr Leroy had provided outstanding contributions to the activities of CIMO over many years and in a variety of domains. The MG agreed to propose to the WMO Secretary-General that the Certificate for Outstanding Services to WMO and particularly to CIMO should be presented to Mr Michel Leroy. This certificate shall be given in recognition of his long and outstanding contribution to the standardization of instruments and methods of observation, his leadership and inspirational role in conducting instrument intercomparisons, and his active and ongoing participation in numerous CIMO activities and conferences throughout his professional career.
     3. **E-learning**
     4. In response to the requests by CIMO-16 for CIMO RICs to consider the design and realization of more online courses like those previously organized by RTCs Buenos Aires and Beijing, and in response to the encouragement by Cg-17 for CIMO to explore, in collaboration with the ETR Programme, the development of online training courses on instruments that could complement face-to-face training events, an exploratory attempt was made to produce a short video recording of IPC-XII (2015) that conveyed the role of CIMO intercomparisons to the broader WMO community.
     5. The session expressed its appreciation for the work of Mr Joel Fisler and other authors for developing the video of IPC XII (https://vimeo.com/164968933), which conveyed so well the core role of CIMO. It was suggested that a shorter version of the video should be developed for public consumption. The president advised the session that such videos cost relatively little to produce, so were a resource-efficient method of communicating our role and key messages to both profession and public audiences.
     6. In view of the success of this first exploratory CIMO venture into e-learning, the president invited suggestions from the meeting participants on how best to go about the more regular use by CIMO of e-learning techniques for capacity development and outreach amongst the WMO community.
     7. It was noted that we cannot do everything, so it would be best to concentrate initially on core activities of CIMO, as far as possible using material that already exists. Numerous training courses are held by the RICs, so these could be recorded and those recordings placed on the CIMO website. E-forums between the RICs addressing key technical questions could also be encouraged. It was stressed that such e-learning tools must be clearly targeted at a particular audience.
     8. A number of specific priority topics for e-learning were suggested, including:
* A short video on ‘Measurement as an output’;
* A video on the importance of RICs and their role in the measurement quality chain;
* A video on the benefits of ISO17025 accreditation.
  + 1. In view of his experience with creating the IPC-XII video, Mr Fisler had been asked to recommend to the CIMO MG regarding how to go about further use of e-learning within CIMO. Mr Fisler suggested formation of a small ad-hoc group (consisting of an ETR representative, members of training organizations familiar with e-learning and/or with training on the siting classification, and a few CIMO experts) which could develop e-learning material on the siting classification for public distribution on the web. The session welcomed this proposal, suggesting the involvement of RIC Buenos Aires and members of ET-OIST.
    2. Mr Fisler had also suggested the establishment of a task team on e-learning in collaboration with ETR, which could include RTC representatives, RIC representatives and other CIMO experts in training and education. That task team should work (in collaboration with other CIMO Expert Teams) on:
* Identification of the existing CIMO related education and training material available on-line;
* Accessibility of that material to the Members through a common, easily accessible, WMO/CIMO and/or WMO/ETR website;
* Enabling closer collaboration with relevant institutes, universities which are offering on-line training on CIMO related issues, aiming at availability of that material to the Members;
* Identification and definition of the CIMO related education and training needs of the Members;
* Development of a strategy for CIMO related on-line education and training courses, which should include needed resources and time-line for its implementation.

The president thanked Mr Fisler for this recommendation and requested Messrs. Garcia, Merrouchi and Buyukbas to follow it up, with a priority to the first 2 bullets mentioned above.

1. **OTHER BUSINESS**
   1. Volker Kurz made a presentation on the strategies followed by DWD for development and integration of their observing networks.
   2. The meeting welcomed the participation of Mr Jochen Dibbern, Chair of the CBS OPAG-IOS, for part of the meeting, which enabled to address collaboratively topics of common interest to CIMO and CBS. Mr Dibbern was invited to present his views on the current and future collaboration of CIMO and CBS and how this collaboration may be relevant in the current review of WMO technical commissions.
   3. The meeting recognized the importance of learning from operational practices implemented in different Member countries, that can be gained by visiting a station or testbed. The meeting therefore recommended that when making arrangements for future sessions of the CIMO Management Group, arrangements be made to enable interested participants to visit a station or testbed from the host country, possibly prior/after the meeting.
   4. Other technical commissions do not limit the number of experts in an expert team by having two distinct type of memberships: core and associate memberships. Associate members usually do not receive WMO financial assistance to attend meetings. The meeting agreed that having these two categories of members could help in getting additional expertise in the expert teams and also for motivating young experts to contribute to CIMO activities and that such a concept should be considered in the future for CIMO as well.
   5. The meeting recognized that having a meeting of an expert team shortly after its formation helps in starting the work and in creating the conditions needed for fruitful and frequent communication between the team members. However, it noted that in view of the limited resources available, this cannot be done for all teams.
   6. The meeting recommended that an on-line mechanism be implemented to enable members of CIMO ETs to exchange material. The meeting requested the Secretariat to seek an interim solution while the WMO Extranet is being develop, and which should later provide such a mechanism.
2. **CLOSURE OF THE SESSION**
   1. The session closed on Friday 8 April 2016 at 12:30 hours

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# ANNEX I

# LIST OF PARTICIPANTS

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# ANNEX II

**FUTURE OF MEASUREMENTS FOR WIGOS**

**Overarching New Drivers:**

* Focus on measurement as an output , which then requires looking at the methods of observation
* Source-agnostic measurements in the spirit of WIGOS
* Supports the utility of measurements that are not traceable (crowd sourcing, big data etc)
* Generic and can be incorporated into any new structure in WMO

**Mission:**

Members achieve fit-for-purpose environmental measurements through appropriate standards and observing technologies.

**Vision:**

We are the source of information on the suitability of measurements for specific environmental intelligence (applications).

* Clarifying the place of measurements in the environmental information chain

**Outcomes:**

1. We are used as the source of information on suitability of measurements for specific environmental intelligence (applications)
2. Users and providers understand the importance of the measurement process in the environmental information chain.
3. Users and providers are committed to traceability of ECV measurements.
4. The quality and utility of emerging measurements is documented in the CIMO Guide and reference material.

**Strategies to achieve this vision:**

1. Collaborate effectively with all users and providers of measurements
2. Develop and promote the implementation of good measurement practices
3. Develop, and provide effective access to, standards and guidance material
4. Coordinate the transition from new science and technology to operational implementation
5. Characterize the utility of measurements from emerging alternative technologies

What are we already doing now *and in the future (2016-…)* for each of these strategies include:

1. Collaborate effectively with all users and providers of measurements
   1. Focal points
   2. CIMO Guide chapters provided by JCOMM, CAS, CBS (Satellite)
   3. TECO and METEOREX
   4. Collaboration with HMEI, BIPM
   5. *Ensure the uncertainties in Table 1d…are consistent within the WMO documentation.*
   6. *Promote discussions on utility of integrated measurements (MW & satellite)*
2. Develop and promote the implementation of good measurement practices
3. Intercomparisons
4. Training courses
5. Liaison with other WMO technical commissions
6. Develop standards (siting classification and ISO)
7. TECO
8. Collaboration with BIPM
9. Competencies
10. Develop, and provide effective access to, standards and guidance material
11. CIMO Guide
12. Cloud Atlas
13. IOM reports
14. Liaison with BIPM
15. Collaboration with ISO
16. *Examine and revise where necessary the uncertainties in Table 1d….*
17. *Develop guidance and outreach material on the importance of the measurement process and support infrastructure (visual, concise, to the point)*
18. Coordinate the transition from new science and technology to operational implementation
19. Testbeds
20. Expert teams work
21. Intercomparisons
22. TECO
23. *Invite external expert to examine a potential emerging measurement system for operational use*
24. *Promote discussions on utility of integrated measurements (Web, TECO).*
25. Characterize the utility of measurements from emerging alternative technologies
26. Tasks within expert teams
27. AMDAR
28. Vaisala Awards (rainfall with radio links, Chinese satellite calibration, ….)
29. Intercomparison (radiation)
30. Testbeds
31. TECO
32. Workshop on emerging measurements and technologies for operational use
33. Invite external expert to examine a potential emerging measurement system for operational use

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**ANNEX III**

**DECISIONS AND OUTCOMES OF THE 17th WMO CONGRESS RELEVANT TO CIMO**

**INTRODUCTION**

1. The World Meteorological Congress at the Seventeenth Session (Cg-17), which was held in Geneva from 25 May to 12 June 2015, urged all Members to contribute to implementation and operation of the WMO Integrated Global Observing System (WIGOS) and the WMO Information System (WIS) which are strategic initiatives of WMO and were included in a set of eight high-level Expected Results (ERs). Particularly, Members were urged to implement and operate their observing networks and systems in accordance with the WMO Technical Regulations (WMO-No. 49), Volume I, Part I – WIGOS and its Annex – Manual on WIGOS, which Congress adopted through:

1. Resolution 25 (Cg-17) – Technical Regulations (WMO-No. 49), Volume I, Part I – WMO Integrated Global Observing System, and
2. Resolution 26 (Cg-17) – Technical Regulations (WMO-No. 49) – Manual on the WMO Integrated Global Observing System.

***WMO Integrated Global Observing System and WMO Information System***

1. The WIGOS Implementation phase (2012-2015) had focused on developing and implementing a framework for improved governance, management, integration and optimization of the multiple observing systems coordinated by WMO and its partner organizations, and resulted in an adoption of Regional WIGOS Implementation Plans (R-WIPs) by regional associations, taking into account regional and subregional needs and priorities.
2. Further development of WIGOS continues during its Pre-Operational Phase (2016-2019) building upon and adding to those key building blocks of the WIGOS Framework that have already been implemented, while shifting the emphasis from the global level toward implementation activities at the regional and national levels. The goal is to have Members and their partners benefit from a fully operational system from 2020.
3. The WIGOS Pre-Operational Phase focuses on:
4. complementing the WIGOS Regulatory Material with necessary guidance material providing Members with those technical details that are required for the implementation;
5. further developing the WIGOS Information Resource (WIR), with special emphasis on the operational deployment of the Observing Systems Capability Analysis and Review Tool (OSCAR) / Surface database;
6. development and implementation of the WIGOS Data Quality Monitoring System;
7. concept development and initial establishment of Regional WIGOS Centres; and
8. national WIGOS implementation.
9. Regional WIGOS Centres (RWCs) will play a critical role for the operational WIGOS. RWCs will provide regional coordination and support of WIGOS development and operations at regional and national levels, working closely with data providers to facilitate: (i) the collection of WIGOS metadata, and entry into OSCAR/Surface; (ii) regional performance monitoring of WIGOS networks, including follow-up with data providers in case of data availability or data quality problems; (iii) definition and coordination of regional/subregional WIGOS implementation projects; and (iv) advice to Members on the requirements for the regional network design.
10. The effective management of data throughout its lifecycle is essential to ensuring that Members are able to extract full value from their observations and their observing systems. Hence, development of guidance on data management is important to the success of WIGOS and needs special focus and attention. Cg-17 requested all relevant technical commissions, under the overall coordination by ICG-WIGOS, and in conjunction with CCl activities on climate data management, to be fully engaged in the development of data guidance, which should include high-level principles and strategies for data management within the broader WMO context.

***Instruments and Methods of Observation Programme within WIGOS***

1. Cg-17 expressed its appreciation to the Instruments and Methods of Observation Programme (IMOP) and the Commission for Instruments and Methods of Observation (CIMO) for their ongoing efforts to develop guidance for Members in operating their instrument systems and to support their continuous improvement, particularly aiming enhancement of the effective and economic use of observing technology and systems.
2. In view of the importance of the Instruments and Methods of Observation Programme and its contribution to the WMO high priorities, Congress adopted Resolution 27 (Cg-17) – Instruments and Methods of Observation Programme, which is provided in the Appendix I.
3. Congress noted the report of the sixteenth session of CIMO and appreciated the considerable work achieved in strengthening capacity development, standardization of instruments and methods of observations, developing guidance material and increased collaboration with other technical commissions. In regard to that, Congress adopted Resolution 28 (Cg-17) – Report of the sixteenth session of the Commission for Instruments and Methods of Observation, which is given in Appendix II.
4. Cg-17 noted that CIMO had long contributed to the global improvement in the quality and traceability of observational data from basic observational instruments, which had resulted mainly from the implementation of standardized calibration, maintenance and operational procedures, supported also by the establishment of the WMO Regional Instrument Centres (RICs) and Regional Radiation Centres (RRCs). Congress acknowledged CIMO reinforcement of these contributions through its co-leading role in the implementation of the WIGOS Framework. In the context of aircraft observations, similar improvements had been achieved through the AMDAR system.

**Standardization of Weather Radar Practices and Procedures**

1. Weather radars are widely disseminated worldwide and Members are investing very large amounts in this technology, including in developing countries, while significant deficiencies remain to ensure their overall data quality and their integration with other observing systems’ data. There is a growing conflict between the operation of wind turbines and weather radar systems. The existing CIMO recommendations on separation distance between wind turbines and weather radar are based on advice from CIMO experts. Many Members need scientific justification to defend the undisturbed operation of their systems. **Therefore, Congress requested CIMO to coordinate scientific studies and work on more specific recommendations on the separation between wind turbines and weather radar systems.**
2. Cg-17 agreed to focus on harmonization of data quality processes and procedures where there is a clear benefit to the global user community and where this will not hamper innovation. In view of the need for a single international coordination mechanism for weather radar systems and their data and products, a new initiative is required that utilizes existing bodies as far as possible, to achieve global weather radar data consistency. This would provide a key contribution to the WWW Global Observing System (GOS), the backbone component of WIGOS. **Congress requested CIMO to establish a CIMO/CBS-led international coordination initiative for standardization of practices and procedures for weather radar systems**, which should include all Members, partners and entities operating weather radar networks, capitalize on the positive experience achieved within regional cooperation mechanisms, such as OPERA and BALTRAD in Europe, and include a strong focus on capacity development to ensure coordinated weather radar data quality across regions.

**Standardization and guidance on Surface-Based Observing Technologies**

1. **Cg-17 requested CIMO to explore options for improving standardization of other surface-based observing systems and techniques**, particularly for remote-sensing systems such as radar wind profilers and techniques such as water vapour retrieval using ground-based global positioning system receivers.
2. With regard to the variety of simple and sophisticated observing technologies available on the market, small NMHSs have been facing the challenges in selecting suitable observing solutions fit for their purpose. **CIMO was requested to develop additional guidance material to help Members in their procurement practices and in assessing the quality and suitability of observing systems, such as automatic weather stations.**
3. Some Members had had positive experiences in determining rainfall estimates from cellular communication networks. The density of precipitation gauge networks is declining throughout the world, and in some areas such measurements are very scarce, while, in contrast, cellular communication networks are being deployed widely, even in less developed countries, in all areas with significant population densities. Members were encouraged to liaise with mobile phone companies towards setting up arrangements with them to enable them to use the mobile phone signal attenuation data, which could support them in deriving precipitation maps for their country. **Congress requested CIMO to develop guidance material to support Members in utilizing this technology for rainfall estimates.**
4. CIMO and RA VI had agreed to collaborate on the observing challenges faced at mountain stations. Cg-17 encouraged collaboration between CIMO and regional associations in furthering implementation and operation of efficient observing technology in high mountain areas and the development of guidance for Members on best practice in this challenging area of observations.

**Minamata Convention on Mercury**

1. The Minamata Convention on Mercury (http://www.mercuryconvention.org/), developed by UNEP, is a global treaty to protect human health and the environment from the adverse effects of mercury. It is planned to enter into force in 2020. All Members are requested to develop roadmaps to prepare themselves to introduce alternative instruments in their network and to ensure the continuity and quality of their observations, including carrying out parallel observations, as appropriate. **Congress tasked CIMO to support Members by developing appropriate guidance material and supporting the identification of appropriate replacement instruments.** Members who have already transitioned away from mercury are urged to publish their findings and share their expertise on a single platform that is accessible to all Members.

**Regional Centres**

1. A strong focus on the strengthening of RICs, including increasing their support to Members of the Region, is also visible in R-WIPs. Some RICs have already started further improvement/modernization of the services they can provide to Members through ensuring the traceability of reference standards used by Members and through capacity development and training related to instrument calibration and maintenance. Cg-17 urged Members hosting RICs to continue their efforts to maintain and improve their capabilities, including pursuing accreditation under ISO/IEC 17025, and encouraged them to proactively reach out to the Members of their Region, thus supporting them in achieving the goals listed in the R-WIPs. Furthermore, regional associations are requested to monitor regional needs for RIC services, to ensure their RICs are regularly evaluated and to actively cooperate with CIMO and JCOMM in conducting training to meet the needs of their Members.
2. The guidance material to support RICs and Members’ calibration laboratories to estimate calibration uncertainties, as well as the plan for a training workshop on this matter, had been developed. Noting the strong interest shown by Members for training courses on instrument calibration and maintenance that had been held recently, Cg-17 encouraged Members hosting Regional Training Centres (RTCs) and RICs to organize additional such courses to meet the demand of Members, and to ensure traceability of observations to the International System of Units (SI) and to improve their quality.

**WMO Regulatory Material**

1. Cg-17 was pleased that the WMO Guide to Meteorological Instruments and Methods of Observation (CIMO Guide, WMO-No. 8, 2008 Edition, Updated in 2010), previously only available in English, had now also been published in French, Russian, and Spanish languages to support further improvements of the quality of observations and standardization of instrument performances worldwide. Congress expressed its thanks to those Members who had arranged for the translation and publication of the CIMO Guide into these languages. CIMO had actively cooperated with other technical commissions in developing a new edition (2014 Edition) of the CIMO Guide, which had been approved by CIMO-16 and which included a number of fully revised chapters and an extensive new part on satellite observations. Noting that this new material should also be translated in the official WMO languages so that all Members fully benefit from the new guidance material, Congress requested the Secretary-General to identify necessary resources for this purpose, and encouraged Members to continue their engagement in volunteering to translate the new edition of the CIMO Guide and/or to provide financial contributions for this work.
2. Congress appreciated that CIMO has taken steps in developing a new web-based edition of the International Cloud Atlas (ICA) – Manual on the Observation of Clouds and Other Meteors (WMO-No. 407, Volumes I and II) as a WIGOS-related document needed for the operation of NMHSs, particularly in developing countries. This activity will ensure that the ICA remains the world’s authoritative, primary source of cloud classification, fully comprehensive and containing the most up-to-date information. Members were urged to make experts and resources available for this activity, and to consider developing and/or hosting the ICA web-based version. The update of the International Cloud Atlas would need to be made by correspondence. Cg-17 delegated EC to approve the Atlas and ensure its prompt publication. Congress voiced support to fund that activity under regular budget to the extent possible within available resources.

**Standards**

1. The first common WMO-ISO standard had been approved based on the “Siting Classification for Surface Observing Stations on Land” originally developed by CIMO for WMO Members. Appreciating that, **Congress further requested CIMO to collaborate with ISO on the second common WMO-ISO standard “Ground based remote sensing of wind by heterodyne pulsed Doppler lidar”.** Such synergies were recognized as beneficial to improve the standardization of observations according to WIGOS Framework implementation. In this regard, common WMO-ISO standards should be considered when both WMO and ISO have a topic of common interest and similar goals. **CIMO was requested to monitor and, if appropriate, contribute to the development of the weather radar standard that ISO has decided to develop.**
2. WMO and the International Bureau of Weights and Measures (BIPM) efficiently collaborate to ensure the maintenance of international scale and traceability of measurements that are particularly relevant to ensure data traceability to meet the goals of WIGOS and GFCS. The World Radiation Reference (WRR) maintained by WMO and recognized by BIPM, apparently differs from a new SI-traceable cryogenic radiometer value. **Cg-17 requested CIMO to collaborate with BIPM in assessing the situation and determining whether a change of reference for solar irradiance would be needed to ensure the continuity of climate-relevant time series.**

**Instrument Intercomparisons**

1. Cg-17 expressed its appreciation for the valuable contribution made to the improvement of standardization and traceability of observations by a number of international instrument intercomparisons, such as International Pyrheliometer Intercomparisons (IPCs) at regular intervals to disseminate the WRR to Members, and WMO Solid Precipitation Intercomparison Experiment (SPICE). Congress was pleased that a number of WMO Programmes and initiatives had expressed interest in SPICE and encouraged all Members hosting a site, and interested stakeholders, to consider taking advantage of these sites to support other initiatives, such as the Executive Council Panel of Experts on Polar Observations, Research and Services (EC-PORS), verification of models and radar calibration, ground validation of satellite data and to ensure the continuation of the measurements at these locations.
2. Cg-17 also noted with appreciation the feasibility study being carried out towards an intercomparison of ground-based instruments for detection and quantification of volcanic ash/aerosols, and recognized its importance to the ongoing enhancement of aeronautical meteorological services for emergency responses to volcanic eruptions, demonstrating the close collaboration between CIMO, CAS and CAeM in application of science meeting societal needs.

**Training**

1. In view of the strong interest of Members in courses related to instruments and methods of observation and their importance for ensuring data quality and the sustainability of observing networks, **Cg-17 encouraged CIMO to explore, in collaboration with the ETR Programme, the development of online training courses on instruments that could complement face-to-face training events.** Members were encouraged to share any such courses they have developed, so that they can be made widely available to all Members.
2. Recalling that at its sixteenth session Congress had requested TCs to develop competency standards in the key areas of interest to each technical commission, Cg-17 noted that CIMO was in the process of developing competency standards for personnel involved in undertaking weather observations, calibrating and maintaining equipment. **Congress encouraged CIMO to finalize those competency frameworks and present them to EC for consideration and for inclusion in the WMO Technical Regulations as recommended practices.**

**Centennial Stations**

1. Cg-17 noted the support expressed by CIMO to the Commission for Climatology in developing a concept of establishing a recognition mechanism for centennial observing stations that would include designation criteria to protect well-sited long-term observing stations, with good quality time series of meteorological parameters.

**CIMO Trust Fund**

1. The resource allocated to IMOP will not be sufficient to achieve the high expectations from other WMO Programmes and high priority activities. Therefore, Congress urged Members to contribute to the CIMO Trust Fund to further facilitate timely conduct of IMOP activities to meet Members requirements.

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**ANNEX IV**

**EXCERPT FROM PTC-2016**

The meeting made the following input into the CBS led-review of the challenges and risks, opportunities and benefits of big data, crowd sourcing and social media as the basis for production of a guidance document for Members:

1. Crowd-sourcing applications as a complement to traditional observations:
   * can be an important source of verification of observations and forecasts for quality control (CIMO);
   * can be useful for assessing health impacts, e.g. in relation to air quality (CAS);
   * will be explored by CHy in terms of using simple devices for stage measurement for irrigation ditches and small streams that can produce data streams that complement traditional data collection systems (results can be input into CBS-led review);
   * can be used to assess phenology, noting that reference data is also still required, e.g. the case of eastern Europe (CAgM);
   * examples generating actual data
     + Weather Observations Website (WOW) engine;
     + Weather Underground (generates 170,000 observations globally, used after Quality Control (QC);
     + Hong Kong, China Community Weather Information Network (CoWIN) (mostly used for education purposes);
   * CBS has a team on public weather services (PWS) that addresses big data from new media, including a focus on information products and improvement. CMA (China) has had relevant experiences with documentation of actions taken by the public based on warnings.
2. Public-private dimensions:
   * Reliance on private sources can create dependencies, e.g. if a company making car thermometer readings changes its access policy or goes out of business;
   * The private sector is good at marketing its services, and may make claims regarding quality and cost-effectiveness that WMO would not endorse, including to policy-makers;
   * Freely-available weather observation and forecast data on the Internet and social media are posing significant challenges to the authoritative voice of NMHSs and require proactive approach to make the best use of the big data in operations and to educate the public and the media on interpretation of the big data;
   * The review should clarify what can and cannot be done, while being careful not to favour any particular private interests; and
   * Some data (traditional or non-traditional) may have high commercial value (e.g. marine weather) and/or may be commercially protected.
3. There is a need for a bench-marking system for evaluating the value of different types of non-traditional observations, as they may either fill gaps or be redundant. The assessment can involve the use of NWP models and can also validate the value of traditional meteorological observations at the same time.
4. Big, structured, data sets will become increasingly important and the size will increase fifty-fold due to resolution improvements. Receiving stations are expensive. ICT-WIGOS may establish a Task Team on data issues which could contribute to the review in these areas.
5. The need for review:

* The meeting noted that the review needs were highly visible and the need to give WMO’s view on the current state of the art and what can be done. There is a relationship between the review of the implications of Resolution 60 (Cg-17), on international exchange of climate data and products, and emerging data from non-traditional sources, since if partners find they cannot access data through NMHSs they may be forced to turn to (or even establish) alternatives. Some development partners such as UNDP and the World Bank are already channelling significant resources into strengthening observing systems but not necessarily according to WMO standards. PRs are under pressure to accept these ad hoc systems.
* The situation with respect to both traditional and non-traditional systems, and the business models that support them, are changing and need to be evaluated together, along with considerations about public-private partnerships. The reviews called for by this resolution (65, Cg-17) and Resolution 60 (Cg-17) together provide an opportunity to answer questions such as, “how much is good enough? How much should countries invest in observations? And what are some of the options/schemes for sustaining adequate observations drawing on traditional and non-traditional sources?”

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**ANNEX V**

**WIGOS AND GFCS**

* 1. The Seventeenth WMO Congress identified the following highest priorities for the WIGOS pre-operational phase:

(a) National WIGOS implementation;

(b) WIGOS regulatory material complemented with necessary guidance material to assist Members with the implementation of the WIGOS technical regulations;

(c) Further development of the WIGOS Information Resource, with special emphasis on the operational deployment of the databases of the Observing Systems Capability Analysis and Review tool;

(d) Development and implementation of the WIGOS Data Quality Monitoring System;

(e) Concept development and initial establishment of Regional WIGOS Centres;

* 1. The Fifth Session of the Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS-5) was held at the WMO Secretariat in Geneva, Switzerland, from 25 to 28 January 2016.
  2. ICG-WIGOS reviewed the progress towards the implementation of WIGOS achieved by the Technical Commissions (TCs) and the Regional Associations (RAs). Further, it reviewed outcomes from ICG-WIGOS Task Team meetings, and WIGOS-relevant workshops. In this regard, ICG-WIGOS expressed its appreciation of the progress achieved and thanked all involved experts and contributors.
  3. ICG-WIGOS further discussed the progress made in the five key priority areas established by Cg-17 for the WIGOS Pre-operational Phase (2016-2019), including the concept development for Regional WIGOS Centres. Based on its deliberations, ICG-WIGOS formulated its recommendations on a further elaboration of the draft Plan for the WIGOS Pre-operational Phase (PWPP) to be submitted to EC-68 for approval. Finally, ICG-WIGOS considered its future working structure.

***WIGOS Working Structure***

* 1. ICG-WIGOS decided to close down two task teams, namely Task Team WIGOS Regulatory Material (TT-WRM) and Task Team WIGOS Quality Management (TT-WQM), and to establish the following new Teams: a) WIGOS Editorial Board (WEdB); b) a Task Team on the WIGOS Data Quality Monitoring System; c) a Task Team on WIGOS Data and Partnership. Regarding the Task Team WIGOS Metadata (TT-WMD) it was decided to keep the team active until the end of 2016 and then to establish a new Task team on OSCAR Development.

***SORT***

* 1. ICG-WIGOS reiterated the general requirement for the development of the Standardization of Observations Review Tool (SORT) and requested D/OBS that it be brought to the attention of EC-68 in order to gain support of EC for its further development and to guarantee resources needed. ICG-WIGOS was of the opinion that even though SORT would meet a requirement for the organization as a whole rather than being specific to just WIGOS, it would be important that WIGOS take the lead in its development and that it retain an ownership stake in the system. Finally it was proposed to organize a dedicated SORT development workshop.

***Vision for WIGOS in 2040***

* 1. ICG-WIGOS-5 recalled the request from EC-66 to CBS to lead the development of a “Vision for WIGOS in 2040”, with involvement of the other technical commissions and to submit such a vision to Cg-18 in 2019 for approval. An initial draft Vision for the WIGOS Space-based component in 2040 was developed.

***WIGOS Regulatory Material***

* 1. ICG-WIGOS considered how to establish the process for reviewing draft text developed by the Secretariat and/or relevant TC experts for updating WIGOS regulatory material and for new guidance material. In this regard, ICG-WIGOS decided to terminate TT-WRM and to establish a small WIGOS Editorial Board of 3 members; with representatives of CBS, CIMO.

***OSCAR Database***

* 1. ICG-WIGOS agreed that OSCAR/Surface was sufficiently mature as a metadata repository for it to be declared operational. ICG-WIGOS asked the OSCAR development team to make the necessary preparations to declare OSCAR/Surface operational on 2 May 2016, and to issue appropriate notices to Members, including in the [Operational Newsletter](http://www.wmo.int/pages/prog/www/ois/Operational_Information/index_en.html) of the [WWW Operational Information Service (OIS)](http://www.wmo.int/pages/prog/www/ois/ois-home.html).

***WIGOS and GFCS***

* 1. During ICG-WIGOS, the contribution of WIGOS to the implementation of the Global Framework for Climate Services (GFCS) was discussed. The role of WIGOS and its contribution to the Observation and Monitoring Pillar was identified, e.g. in promoting and improving observing standards, sharing experiences and best practices on data processing, quality control, data management, data exchange, observing system/data integration.
  2. In this regard, the need for synergy, enhanced collaboration and coordination was reiterated. It was pointed out the success of this will depend on the establishment of practical working arrangements and appropriate mechanisms for GFCS and WIGOS to work together. The opportunity to work together on some current GFCS pilot projects was recognized as being an important first step in this direction. In this regard the Secretariat was requested to propose a way forward. ICG-WIGOS agreed that EC-68 should provide guidance on the future relationship between WIGOS and GFCS, and their collaboration. ICG-WIGOS also requested D/OBS and D/GFCS Office to work toward a stronger and more focused Secretariat coordination between these two WMO strategic priorities.
  3. The way in which CIMO can better support GFCS will become clearer when the EC-68 provides guidance on how WIGOS and GFCS should interact. However, the meeting is invited to consider how CIMO could better contribute to GFCS through the work of its expert teams and/or in other manners.

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# ANNEX VI

# DRAFT TERMS OF REFERENCE FOR WMO INTER-PROGRAMME EXPERT TEAM ON OPERATIONAL WEATHER RADARS

Within the WIGOS framework, under the governance of CIMO and the joint guidance of CIMO and CBS, act as the WMO primary working group on operational meteorological radars (S, C and X band) with responsibility to:

1. Develop and propose guidance on:
   1. Standardization of, and regulations and guidance on, systems requirements and specifications, quality control, maintenance and operation, data processing algorithms, data products and data quality monitoring;
   2. Response to requirements of data users; and
   3. Training and capacity development.
2. Contribute to development of methods, models and formats for the international exchange of meteorological radar data and metadata.
3. Provide advice on network design.
4. Provide guidance on radio-frequency allocation and protection.
5. Review and report on potential operational developing and emerging meteorological radar research and technologies.
6. Collaborate with other international and regional organizations on relevant matters, particularly including international standards organizations and research bodies and associations.
7. Collaborate with and respond to the requests of WMO constituent bodies, as appropriate.
8. Develop and document proposals for the activities of the IPET-OWR.
9. Report on issues, activities and progress to CIMO and CBS.

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# ANNEX VII

# CONCEPT NOTE FOR THE RA-VI/CIMO WORKSHOP ON OBSERVATIONS AT MOUNTAIN STATIONS

**Theme**

A need for, and challenges of, the operation of AWSs at mountain stations

**Objectives**

Assess the need for observations in mountain regions. Address specific operational problems that mountain stations are facing , such as the maintenance of instruments, siting, and selection of appropriate instruments, provision of data in real/near-real time, including logistical problems related to access to site, power supply and communications. Specific topics mentioned by RA-VI were also the measurement of wind in icing conditions and of precipitation

**Duration, Date and Place**

Duration: 3 days

Date: (Late) March 2017

Place: Davos, Switzerland

**Participants**

Maximum number of participants may have to be limited because of the room capacity (TBD), and to enable fruitful round-table discussions.

1. Participants from all WMO Members are welcome to attend (at own costs), provided room has sufficient capacity.
2. Involvement of experts from several CIMO Expert Teams (Operational In-Situ Technologies, Developments in In-Situ Technologies, Instrument Intercomparisons) and SPICE.
3. Participants should be originating from organization operating stations at alpine/mountain stations, such as NMHSs, universities, academia, research institutes, etc.

**Collaborations:**

1. RA-VI: Originator of the request to CIMO to collaborate on the organization of such a workshop
2. EC-PHORS and GCW Steering Group
3. Mountain Research Initiative (MRI)

**Organization**

A Programme Committee will be established, composed of 2 CIMO experts, 2 RA-VI experts, 1 GCW representative, 1 MRI representative)

Mix of presentations from various communities, including among others Meteoswiss, MRI, RA-VI, GCW and CIMO experts

Organize approximately 4 sessions on specific topics, consisting each of:

1. 1 keynote presentation,
2. 2-4 contributed presentations
3. A panel discussion moderated by the chairman and the presenters (out of which 4-5 recommendations should emerge)

There will also be a half a day excursion to a mountain observation site.

**Draft Programme (very tentative)**

Possible topics for the individual sessions (half day) would be:

1. Official opening, together with registration (first morning)
2. Requirements for observations in mountain regions
3. Design of an AWS in mountain areas (incl. layout of the station, siting of instruments, …)
4. Operation and maintenance of a mountain station (incl. data exchange/access, calibration, power requirements, …)
5. Strategies for selecting instrumentation for an AWS in mountain regions (including considerations of roads, power grid/supply, staff, remote access, ...)
6. Field trip (afternoon of day 2 or 3)

**Tentative Planning:**

1. April/May 2016: Establish Programme Committee
2. June 2016: First announcement
3. October 2016: Draft programme / open registration & abstract submission

**Funding**

1. Meteoswiss: Room, print-outs, excursion to observing site, conference dinner.
2. WMO: Selected participants expected to provide/develop/coordinate the development of specific guidance documents.

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**ANNEX VIII**

**EVALUATION OF CIMO TESTBEDS AND LEAD CENTRES**

Based on evaluation criteria from CIMO-XV session:

| **Evaluation Criteria** | **TB Hohenpeissen**  **berg** | **TB**  **Izana** | **TB**  **Payerne** | **TB**  **Sodankyla** | **TB**  **Lindenberg** | **LC**  **Lindenberg** | **LC**  **Italy** | **LC**  **Chupungn**  **yeong** | **TB**  **Boseong** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Recommendation** | Continued standing. | Continued standing. | Continued standing. | Continued standing. | Continued standing.  Note that there is a LC Lindenberg at the same address! Combine into just a LC? | Continued standing. | Continued standing. | Continued standing.  Work is focussed towards Korea, need correspondence to encourage collaboration with CIMO and producing publications noting CIMO TOR. | Continued standing.  Work is focussed towards Korea, need correspondence to encourage collaboration with CIMO and producing publications noting CIMO TOR. |
|  |  |  |  |  |  |  |  |  |  |
| Main activities that TB/LC carried out in the last 2 years for which results are already available | - Routine  - Sun photometer measurements within AERONET and the PFR network  - Dobson instrument intercompare | - Data recovery using neural networks  - Instrument development  - Research project  - Tesdbed campaigns | SPICE  3 x significant projects | 2 x upper air, 1 by PBL studies | - IR Doppler LIDAR assessment  - Rtadiosonde procedure development  - Ceilometer intercomparison  - Climate chamber error characterisation | Performance and definition of calibration and data processing procedures for optical scintillometers | SPICE  Outreach  Collaborations  HMEI | - 2 x Intercomparison  - Algorithm evaluation  - 3 x field expirements | 7 x projects using tower for PBL |
| Main activities that TB/LC carried out in the last 2 years for which results will soon be available | - 2 x intercomparison  - 2 x routine | - Instrument development  -Intercomparison of international data sets | - Raman Lidar studies  - PBL detection  -Radiometer evaluations  - SPICE | SPICE | None | - determination of cloud cover using various sensors  - determination of sunshine duration using pyranometers | two | - SPICE  - 2 x Intercomparison | 2 x different tower studies |
| Which guidance documents/standard procedures were developed during the last 2 years | 2 x WMO documents | None | None | None | None | None | - EURAMET algorithms  - Develop new lab rainfall simulator | four | None  2 x technical notes (not up to published guidance doc grade) |
| IOM reports / peer-reviewed publications were published in the last 2 years | 26 | 23 | 11 | 9 | 5 | Three | Considerable including 3 x IOM | None | None |
| IOM report(s) presently being developed by your Testbed/Lead Centre | 1 | None | None | 1 | None | None | None | None | None |
| Collaborated with one or more CIMO Expert Teams | - WMO GAW  - Task Team  IPET-OSDE  - WMO Lidar Qualification Working Group | None | ET-II  ET-OIST  GRUAN activities | None | CIMO ET-ORST (B.1)  CBS ET-SBO | CIMO ET-ORST  CBS ET-SBO | CIMO guide  2 x ET | None | None |
| capacity building/training activities have been carried out by the Testbed in the last 2 years | 2 GAW-TEC courses per year | Several courses and global learning exercises | 1 x course | *Question incorrectly answered* | 1 x seminar | 1 x seminar  1 x lecture | 1 x seminar | 2 x workshops | 1 x workshop |
| Twinnings | Moussala/ Bulgaria | Tamanrasset-Algeria | Kenyan Meteorological Service (KMD) at Nairobi | None | None | None | None | One off Indonesia - joint intercomparison and calibration of standard Met equipment | IAP China |
| Testbed/Lead Centre making an oral/poster presentation at this year’s TECO | No | Yes | SPICE | Several | TBD | Likely | TBD | Three | None |
| recent changes in your Test Bed/Lead Centre’s capabilities | 1x enhancement  1 x new system | new MS-700 DNI spectrometer | None | None | None | None | Yes – capabilities expanded | None | Additional CIMO Testbed supporting team |
| recent changes in your Test Bed/Lead Centre’s infrastructure | 2 x new Lidar systems | Platform enhancements | None | None | - laboratory building for laser-optical vertical profiling   New set up to measure time lag of humidity sensors on radiosondes | - laboratory building for laser-optical vertical profiling   New set up to measure time lag of humidity sensors on radiosondes | Capabilities expanded | Exposures improved, new instruments deployed | Ka-band cloud radar installed  - Additional tower sensors installed |
| recent changes in your staffing | 6 temporary staff became permanent | None | None | Minor staff number reduction | Yes – several but competency maintained | Yes – several but competency maintained | None | None | Most staff changed – No statement on competencies! |
| plans for the next two years | - Set-up the German ICOS network (8 stations)  - Countinued routine work | - 1 x instrument purchase  - 1 instrument assessment  - Several algorithms and methodologies | - Develop Payerne as a GRUAN site  - Reinforcement of the lidar–related activities  - Finalise SPICE | Radiosonde TB.  Participation in several international networks.  New 50m tower.  Purchase UAV. | 2 x assessments  1 x test  Drafting of a chapter on operational radar wind profiling for CIMO guide | 4 x research grade projects | WMO-ISO standards on precipitation | 2 x intercomparisons and a field experiement | Several PBL and Satellite data verification projects |
| able to continue in the role of a Test Bed/Lead Centre during the coming two years | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
|  |  |  |  |  |  |  |  |  |  |

**Other TB and LC Requirements:**

* Promote collaboration between CIMO and relevant National Meteorological and Hydrological Services (NMHS)
* Testing, development and standardization of meteorological instruments and their performance for the benefit of all WMO Members
* Utilize and build on both existing state-of-the-art facilities and specific expertise
* Significant contribution towards developing guidance for WMO Members
* **Testbeds** are centres with experimental facilities to assess the capabilities of various ground-based remote-sensing and in situ observations
* **Lead Centres** are centres of excellence in testing of instruments’ performance including in laboratory facilities, and instrument intercomparisons, resulting in standardization
* **Ongoing**: It is expected that TB and LC will regularly produce IOM reports and develpop guidance to be incorporated in the Guide to Instruments and Methods of Observation (WMO-No. 8).
* **Reporting**: CIMO Testbeds and Lead Centre must provide at least one report every two years to the CIMO-MG. These reports will be requested for 31 March 2016 and 31 March 2018.

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**ANNEX IX**

**FORMS FOR CIMO AWARDS SUBMISSIONS**

**Form for Submission of Award for an Extraordinary Contribution to CIMO**

(expand the cells as required)

Further information on the nomination and award process, including the latest version of this form and a list past recipients, are available under: http://www.wmo.int/pages/prog/www/IMOP/xxxxxxxxxx.html

This award will be made to a person who has made for an extraordinary contribution to CIMO - It is likely that only a few of this award would be made per CIMO Session.

Minimum contributory requirements - The nominee must meet ALL of the following criteria:

* The nominee has long-standing (normally at least 8 years) distinguished, dedicated and outstanding contributions to CIMO that have shaped the development and reputation of IMO;
* The nominee has made accomplishments that are significant, widely recognized as such, and are of positive and lasting contribution to IMO and WMO programs;
* The nominee is a recognised leading expert and has demonstrated professionalism and a passion that is a model for others within CIMO.

Eligibility:

* The nominee must be alive and active professionally in the CIMO at the time of nomination.

|  |  |
| --- | --- |
| **Nominee** | |
| **Courtesy Title** | Mr / Ms / Mrs / Dr / Prof / Eng / etc |
| **Family name** |  |
| **First name(s)** |  |
| **Full Postal Address** |  |
| **Country** |  |
| **Tel. number(s)** |  |
| **Fax number(s)** |  |
| **Email(s)** |  |

|  |
| --- |
| **Distinguished, Dedicated and Outstanding Contributions** |
| **State the period of involvement with WMO/CIMO**   * \_\_\_\_ years (during the period of \_\_\_\_\_\_ to 20\_\_\_\_ ) |
| **List the contributions to CIMO that have shaped the development and reputation of IMO.** |

|  |
| --- |
| **Accomplishments that are Significant and Widely Recognized** |
| **List the positive and lasting accomplishments that have contributed to IMO and WMO programs.** |

|  |
| --- |
| **Recognized Leading Expert with Demonstrated Professionalism and Passion** |
| **Describe how the nominee has been a leader and model for others within CIMO.** |

|  |
| --- |
| **Other Significant Activities and Attributes Contributing to CIMO and WMO** |
|  |

|  |
| --- |
| **Draft Text to be included in the Certificate** (max. 50 words) |
|  |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| **Date** |  | **Name and Contact details of Person Filling in the Form** |

Any proposal should be formally sent to the president of CIMO by members the CIMO Management Group.

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**Form for Submission of Award for Outstanding Services to WMO and in Particular to CIMO**

(expand the cells as required)

Further information on the nomination and award process, including the latest version of this form and a list past recipients, are available under: http://www.wmo.int/pages/prog/www/IMOP/xxxxxxxxxx.html

This award will be made to a person who has made an extraordinary AND on-going contribution to CIMO over many years - It is expected that this award will be made very rarely.

Minimum contributory requirements - The nominee must meet ALL of the following criteria:

* The nominee has WMO involvement spanning 12 years or more, with dedication and accomplishments that are above and beyond the everyday and that have made a great and lasting contribution to IMO and WMO programs;
* The nominee has worked consistently and steadfastly with noteworthy/pioneering contributions to the advancement of IMO and WMO at an International level;
* The nominee has provided exemplary leadership, professionalism, personal integrity, and inspiration that have been a motivational model for the growth of others within CIMO;
* The nominee has demonstrated excellence in outreach and building awareness of CIMO roles and programs within WMO and society.

Eligibility:

* The nominee may be retired.
* The award may be given posthumously.

|  |  |
| --- | --- |
| **Nominee** | |
| **Courtesy Title** | Mr / Ms / Mrs / Dr / Prof / Eng / etc |
| **Family name** |  |
| **First name(s)** |  |
| **Full Postal Address** |  |
| **Country** |  |
| **Tel. number(s)** |  |
| **Fax number(s)** |  |
| **Email(s)** |  |

|  |
| --- |
| **Accomplishments Above and Beyond the Everyday** |
| **State the period of involvement with WMO/CIMO**   * \_\_\_\_ years (during the period of \_\_\_\_\_\_ to 20\_\_\_\_ ) |
| **List the accomplishments that are great and lasting that Contribute to IMO and WMO Programs.** |

|  |
| --- |
| **Noteworthy/Pioneering Contributions** |
| **List the contributions leading to the advancement of IMO and WMO at an International level.** |

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| **Exemplary Leadership, Professionalism, Personal Integrity and Inspiration** |
| **Describe how the nominee has provided a motivational model for the growth of others within CIMO.** |

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| **Excellence in Outreach and Awareness** |
| **Describe how the nominee has demonstrated excellence in outreach and building awareness of CIMO roles and programs within WMO and society.** |

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| **Other Significant Activities and Attributes Contributing to CIMO and WMO** |
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| **Draft Text to be included in the Certificate** (max. 50 words) |
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| **Date** |  | **Name and Contact details of Person Filling in the Form** |

Any proposal should be formally sent to the president of CIMO by members of the CIMO Management Group.

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# ANNEX X

# ACTION LIST

**CIMO-MG-14, Offenbach, Germany, 5-8 April 2016**

# Status:

| **Action Nb** | **Para. of Fin. Report** | **Action required** | **Responsible** | **Deadline** | **Status/remarks** |
| --- | --- | --- | --- | --- | --- |
| 1 | [3.9](#Par3_8) | Complete the refined version of the CIMO Vision and Mission statement. | Vice President | 8 May 2016 |  |
| 2 | [3.10](#Par3_9) | Represent CIMO at IPET-OSDE and provide a brief informal report on it to the Management Group at its conclusion. | Dr van der Meulen,  Mr Li | 17 May 2016 |  |
| 3 | [4.1.3](#Par4_1_3) | Ascertain whether outcome of collaboration between Mr Hettrick (Australia) and KNMI on RWP/Wind farm interference could be shared with WMO. | Vice President | 20 May 2016 |  |
| 4 | [4.1.5](#Par4_1_5) | Include a keynote presentation on the Minamata Convention in the TECO programme | Secretariat | September 2016 |  |
| 5 | [4.2.2](#Par4_2_2) | Draft a concept paper a workshop on integration of surface and space-based measurements, and circulate it amongst the Management Group. | Secretariat &  vice-president | July 2016 |  |
| 6 | [4.3.3](#Par4_3_3) | Seek the approval of the Permanent Representative of Netherlands for his participation in the WIGOS Editorial Board. | Secretariat | May 2016 |  |
| 7 | [4.4.3](#Par4_4_3) | Inform Dr Forgan regularly on climate meetings they are attending and on points that would require attention/action from CIMO. | All MG Members | Ongoing |  |
| 8 | [4.4.7](#Par4_6_2) | Invite GCW to contribute to the update of the CIMO Guide to address harsh environments and make it relevant also to GCW. | Secretariat | May 2016 |  |
| 9 | [4.4.7](#Par4_6_2) | Provide the list of issues identified for the CIMO Guide to the CIMO ET-DIST and to the experts that GCW had identified to collaborate with this ET and to request ET-DIST to arrange for the update of the CIMO Guide. | Dr Koldaev  ET-DIST | June 2016 |  |
| 10 | [4.4.11](#Par4_6_6) | Approach Satcom on the possibility to have discussions during TECO-2016 on the need for guidance material on using satellite communications during harsh weather.  Postpone decisions related to the possible development of a CIMO Guide chapter on harsh weather to after TECO-2016. | Secretariat | June 2016 |  |
| 11 | [4.4.14](#Par4_6_9) | Approach appropriately skilled women and invite them to take leading positions within the commission and in the work of the ETs.  Clearly encourage Members to propose women as experts for the CIMO ETs. | All MG Members  Secretariat | Ongoing |  |
| 12 | [5.1.1](#Par5_1_1) | Carefully review Terms of Reference of ET-OIST and its workplan when developing the revised structure of CIMO for the period 2018-2022. | President  Secretariat | June 2018 |  |
| 13 | [5.1.4](#Par5_1_4) | Follow-up isse of WIGOS Metadata Standard to ensure the the standard includes one value for the siting of each instrument, instead of a unique value for the station. | E. Buyukbas | Dec. 2016 |  |
| 14 | [5.1.6](#Par5_1_6) | Approach Environment Canada in order to identify a possible replacement on ET-DIST for Mr Lejbjuk | Secretariat | June 2016 |  |
| 15 | [5.1.7](#Par5_1_7) | Provide a report to CIMO-MG on the deliverables expected to be accomplished by June 2016.  Reprioritize ET tasks accordingly | Dr Warne  All MG Members | June 2016 |  |
| 16 | [5.1.13](#Par5_1_13) | Interview SPICE the project leader and summarize the lessons learned | Secretariat | July 2016 |  |
| 17 | [5.1.21](#Par5_1_22) | Encourage PMOD/WRC to restore the basis of the WISG, the ASR, to an operational state and encouraged its participation in the infrared comparison being planned by the BSRN community for 2017. | President  Vice-President | June 2016 |  |
| 18 | [5.2.4](#Par5_2_4) | Request Mr Apituley to take a stronger coordination role within ET-NRST to support the chair, coordinating at least the contributions from Europe, including those from testbeds and lead centres. | Dr van der Meulen | May 2016 |  |
| 19 | [5.3.5](#Par5_3_5) | Coordinate publication of IOM report from KNMI expert on traceability of transmissiometer. | Dr van der Meulen | May 2018 |  |
| 20 | [5.3.10](#Par5_3_10) | Request clarification from WMO higher management on commitment of Secretariat to publish CIMO Guide updates in a timely manner. | President | June 2016 |  |
| 21 | [5.3.11](#Par_5_3_11) | Identify potential candidates for CIMO EdBd (with very good English knowledge) | All CIMO MG members | May 2016 |  |
| 22 | [5.3.14](#Par5_3_14) | Contact TL-RPM and request review of the content of the CIMO Guide and of relevant WMO Manuals (e.g., Manual on Codes) related to definition of surface pressure and geopotential height for radiosounding to ensure they are in agreement and not subject to ambiguous interpretation, and to develop relevant updates for these documents. | Dr van der Meulen | May 2016 |  |
| 23 | [5.3.15](#Par5_3_15) | Include a link to the ECMWF list of suspect stations on the relevant WMO radiosonde monitoring webpage | Secretariat | April 2016 |  |
| 24 | [5.3.16](#Par5_3_16) | Invite CBS to sensitize Members to the importance of providing full high-resolution upper-air measurements. | Secretariat  TL-RPM | May 2016 |  |
| 25 | [5.3.18](#Par5_3_18) | Liaise with the WIGOS Project Office and TT-WDQMS Chair to identify which type of expertise from CIMO is required for TT-WDQMS to ensure that CIMO could identify and contribute needed expertise to this team. | President  Vice President | May 2016 |  |
| 26 | [6.3.3](#Par6_3_3) | Refine and finalize themes for discussion session at TECO-2016 in the context of the evolving CIMO and WMO priorities. | President  Vice President  Secretariat | June 2016 |  |
| 27 | [6.3.4](#Par6_3_4) | Send suggestions for TECO keynote speakers to Dr Forgan. | All MG Members | 30 April 2016 |  |
| 28 | [6.3.5](#Par6_3_5) | Circulate 2nd announcement to all WMO Members to invite submissions of abstracts and early registration | Secretariat | 30 April 2016 |  |
| 29 | [6.4.4](#Par6_4_4) | Establish the International Programme Committee for the Mountain workshop. | President  Secretariat | May 2016 |  |
| 30 | [6.6.1](#Par6_6_1) | Inform Netherlands and Kazakhstan about MG decision related to their testbed proposals | Secretariat | May 2016 |  |
| 31 | [6.6.3](#Par6_6_3) | Send a letter to Boseong and to Chupungnyeong urging them to strengthen their TB/LC activities for the benefit of all WMO Members | Secretariat | May 2016 |  |
| 32 | [6.7.2](#Par6_7_2) | Approach the hydrological community to assess its interest in having a standard for classification of instruments for rainfall intensity measurements. | ET-OIST  Secretariat | May 2016 |  |
| 33 | [6.8.6](#Par6_9_1) | Develop a concept on what should be developed by CIMO for guiding WMO Members on their procurement activities towards sustaining measurements, including possibly the development of e-learning material. | Vice President  Mr Hartley | June 2016 |  |
| 34 | [6.9.1](#Par6_9_1) | Arrange for posting the procedure and the forms for nominations for CIMO Awards on the website, together with a list of experts having received the outstanding awards, in a way similar to that used for the Vaisala Awards. | Secretariat | May 2016 |  |
| 35 | [6.9.10](#Par6_9_10) | Follow-up on recommendations related to training and collaboration with RTC | M. Garcia,  R. Merrouchi and E. Buyukbas | Dec. 2016 |  |
| 36 | [7.6](#Par7_6) | Provide an interim solution for an on-line mechanism to enable CIMO ETs to exchange material. | Secretariat | May 2016 |  |

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